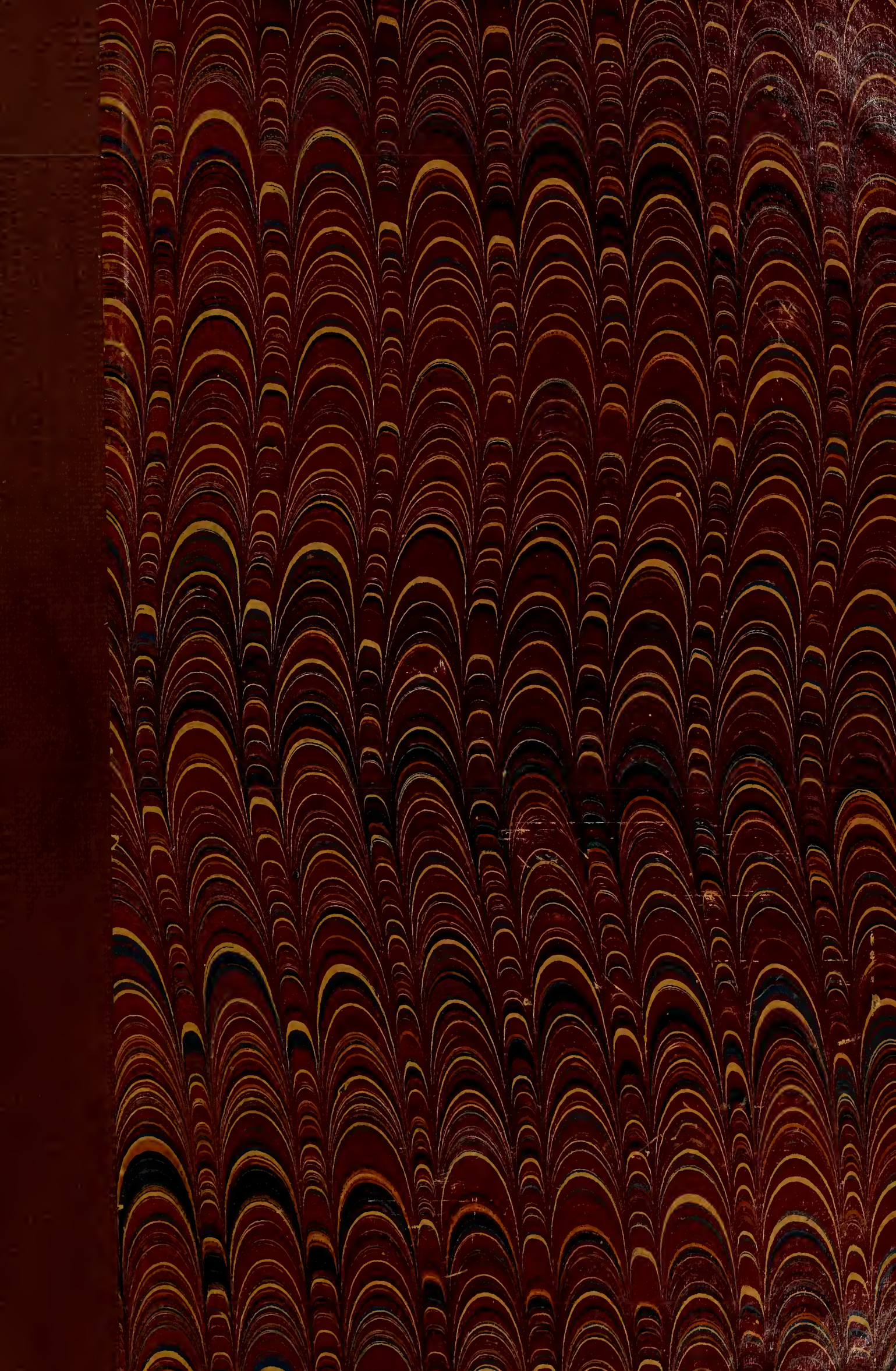

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THE JOURNAL OF MENTAL PATHOLOGY

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THE HELWEG-WESTPHAL TRACT.

(*Dreikantenbahn—Olivenbündel—Fasciculus periolivarius—Fasciculus circumolivarius*).

BY DR. A. GIANNELLI, *Docent University of Rome, Italy, Chief*

Fasciculus circumolivarius).

Our knowledge on the triangular tract of Helweg is as yet incomplete, particularly so as regards its proximal and distal relations with the surrounding structures; much less do we know about its function.

Helweg claims that the irregular tract that bears his name can be found in the insane only, in whom the area corresponding to this tract is easily distinguished by the smallness of its nervous fibres, which is due to congenital defect. Other authors also found that those fibres were thin and rarified, and on that account speak of more or less accentuated degeneration of Helweg's tract,—without having found any actual degeneration in their cases.

Obersteiner, who has published the best description and topographic relations of Helweg's triangle (according to horizontal sections), justly remarks that the distinctness with which this triangle appears is far more variable than is either its form or relation to its surrounding areas. Sometimes this triangle appears so distinctly that it is readily differentiated from the adjoining areas; under such circumstances it is interpreted as being in a condition of marked degeneration, such as it is found to be in the posterior columns during the course of tabes of medium intensity.

An examination of a series of normal and pathologic spinal cords makes me accept Obersteiner's opinion that it is highly improbable (in *hohem grade unwahrscheinlich*) that a clearly

apparent zone of Helweg should, even when showing rarification of its fibres, necessarily indicate that it presents pathologic alterations.

The fibres in Helweg's triangle are especially characterized by thinness of their myelin sheath; this trait is of interest particularly because it presents individual variabilities. For this reason my analysis of those published papers on Helweg's triangle, which I have examined, makes me think that the authors treated of the more or less marked distinctness of the triangle rather than of true degeneration, the latter being of more rare occurrence than is generally admitted. Hence the importance of the study when there is true and complete degeneration of Helweg's triangle, as such a study makes it possible to follow its exact course as well as its relations with the surrounding areas.

Recently I have had occasion to examine the medulla oblongata of an idiot with agenesia of the ocular globes and atrophy of some tracts of the olfactory nervous system. Unfortunately, serial sections of the spinal cord could not be made. Horizontal sections, at the level of the beginning of the distal end of the pyramidal decussation, show an area of degeneration in the lateral columns; this area is of an irregular triangular shape and situated at the periphery of the lateral columns; the anterior angle is rounded and runs into the anterior radicular fibres that emerge laterally from the anterior horn (fig. 1, *a*).

Within and behind the described area of degeneration is seen a markedly rarified zone separated from the central gray matter by a thin band of normal fibres in front of the pyramidal tract of the lateral column. Its form on the surface of the section is almost circular (fig. 1, *b*).

In the triangular area the degeneration is complete; peripherally are seen some very small fibres; in the circular area there is, on the contrary, highly marked rarification of the fibres, and there is no distinct line of demarkation between the degenerated and normal tissue.

The respective positions of the two described zones are maintained throughout the course of the pyramidal decussation. These positions change at the end of the decussation, where the *oliva accessoria medialis* begins: here the triangular area is situated externally to the external end of the *oliva accessoria medialis*,— back of the most lateral part of the pyramidal tract (fig. 2, *a*). Just behind the triangular area is situated the rarified area, the shape of which is here more rounded (fig. 2, *b*). Between the two is always seen a thin layer of normal fibres.

At the point of complete decussation of the sensory tracts,

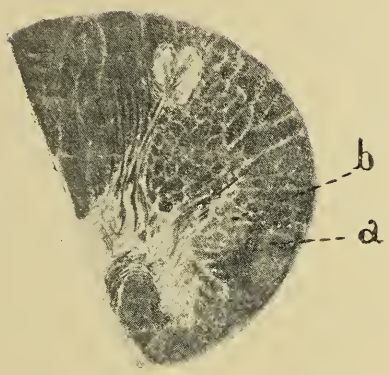

Fig. 1. Section of the cervical spinal cord a little before the pyramidal decussation; *a*, Helweg's area; *b*, the round, rarified zone.

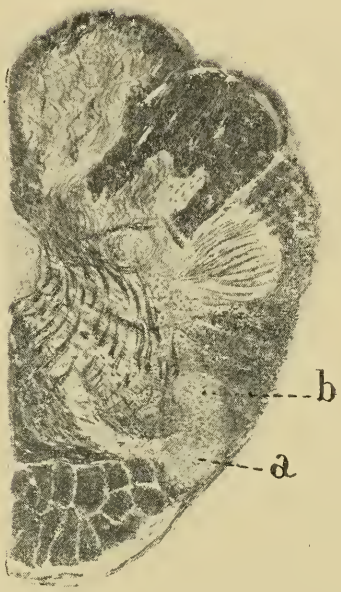

Fig. 2. Section of the medulla oblongata at the level of the beginning of decussation of the sensory tracts; *a*, Helweg's area; *b*, the round, rarified zone.

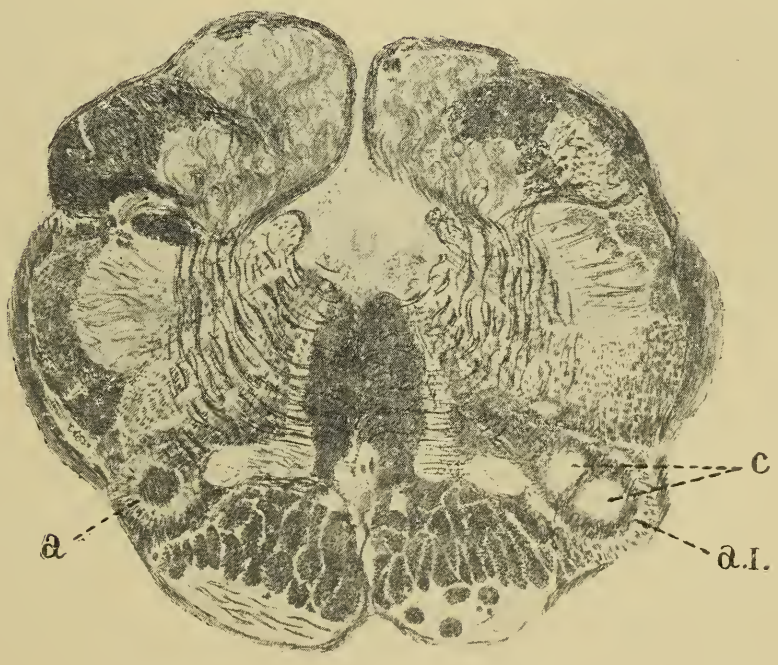

Fig. 3. Section of the medulla oblongata at the level of the most distal part of the bulbar olive. The section is somewhat oblique, the left side being at a lower level than the right; *a*, on the left side, Helweg's area, appearing at first as a circle, then as a semi-circle, *a.1*, on the right side, containing the beginning (*c*) of the bulbar olive.

and before any trace of the *oliva inferior* is seen, the completely degenerated triangular area is essentially changed in form. At first it is seen as a small circle containing an area of normal fibres, (fig. 3, *a*) ; immediately afterward it takes on the shape of a semi-circle parting from the external end of the *oliva accessoria medialis,* its convexity being turned forward and outward; the other end is turned backward and inward (fig. 3, a 1). The semi-circle is visible even with the naked eye; it embraces a complexus of normal fibres, in the middle of which appears the most distal part of the *oliva inferior* (fig. 3, c), which, in its turn, spreads out gradually in a manner similar to that seen in sections of the proximal end, always remaining limited anterolatero-posteriorly by the degenerated semi-circle.

With the appearance of the *oliva inferior* the posterior degenerated zone is pushed backward and it presses against the ascending (descending) root of the fifth nerve.

The semi-circular degenerated area is limited externally by from the lateral end of the *oliva medialis*: at first it is directed forward and outward, then turns abruptly backward and inward ending about the middle of the dorsal leaflet of the *oliva bulbaris.*

The semi-circular degenerated area is limited externally by segments of coarse fibres, directed obliquely, all being turned in the direction of the centre of the plane circumscribed by the degenerated area; besides, that portion of the area which is situated at the periphery of the medulla is also limited by the superficial ventral arciform fibres. Along the inner side of the semi-circular area there are tufts of fibres of the olivo-cerebellar system; these present themselves at first (distally) only in the dorsal part of the inner side of the degenerated area, then turn abruptly ventrally also.

With the increase of the bulbar olive the *fasciculus circumolivarius* becomes thinner, while its curve embracing the olive becomes larger. Besides, like in the upper planes of the olive, there are, within the degenerated area, transverse sections of fibres of a limited number at first, then of large calibre, but which become more abundant later. In the proximal part of the olive these fibres run closer and closer together until the semi-circular area becomes completely effaced.

In its proximal end Helweg's tract has the shape of a groove, appearing in horizontal sections as a semi-circle embracing the external part of the bulbar olive. For the reason of this topography it should be termed *fasciculus circumolivarious.* Its gradual disappearance as it mounts proximally indicates that its fibres are in relation with the cells of the olivary leaflet itself.

The bulbar olive does not present any alterations; the cells of its leaflet are normal and distinct, as are those of the *oliva medialis and dorsalis.*

This finding shows that the triangular tract ends in the olivary body and does not extend directly into the cerebrum, as Helweg claimed it did. What Helweg has described as a continuation of this tract in the cerebrum corresponds to Bechterew's central cerebral tract (Centrale Haubenbahn); this tract is said to be in relation with the olivary tract but not in the sense claimed by Helweg, according to whom there is a direct continuation of the triangular tract. The two tracts are supposed to constitute, on the contrary, one system of fibres that is interrupted in the olivary body.

In Bechterew's illustration (*Text book on the cerebral and spinal tracts*), relating to the most proximal periolivary tract, this tract is triangular, external in relation to the pyramidal tract, alongside the margin of the medulla oblongata and its antero-internal side is in contact with the bulbar olive. According to Bechterew, it disappears abruptly at the level of the lower end of the bulbar olivary body.

In a later publication Bechterew claims never to have said that Helweg's triangle presented a system of ascending fibres, as was interpreted from some statements made in his previous works. It certainly seems from his statements that the tract is in relation with the lower olivary body; nevertheless, up to the present time there is no positive proof of this and the term *fasciculus periolivarius* used by Bechterew indicates only a relation near to the olivary body.

Bechterew claims that the fibres of Helweg's area become covered with a myelin sheath quite late, after the pyramidal tract, so that its development is added only after birth.

Ghiese confirms this opinion. In the medulla oblongata of a child one day old I did not find any myelin fibres either in the pyramidal or in Helweg's tract, while in the medulla of a child nineteen days old there was decided myelinization of both tracts; and I could see Helweg's tract in the proximal end of the medulla; the tract appeared triangular externally to the pyramidal tract, as indicated by Bechterew, extending to the beginning of the distal end of the bulbar olivary body, where it disappeared abruptly. I could not trace it higher up. In two serial sections of the medulla oblongata of adult men the results were negative: these sections were made in the sagittal and vertico-transverse (frontal) planes, but I could find no trace of the extension of Helweg's tract.

On the other hand, the so-called degenerations, more or less marked, of this tract mentioned in literature do not furnish any positive data on the proximal end of Helweg's tract.

It is claimed that Helweg was of the opinion that the tract that bears his name could be found in the insane only, and that in such cases it extended beyond the olivary body into the cerebrum.

Reinhold, who has studied its course in cases of hemorrhage into the floor of the fourth ventricle, could not trace it proximally beyond the end of the pyramidal decussation (Fig. 5, *in* Reinhold).

In Pick's five cases* Helweg's tract was quite recognizable, and he claims to have seen rarification, about the periphery of the olivary body, which gradually decreased upward with the decrease of the olivary body in the same direction; besides, Pick claims that the course of Helweg's and the pyramidal tracts was parallel. Still Obersteiner remarks that perhaps in Pick's cases there was rather a marked clearness of the triangular tract quite independent of any degeneration of the pyramidal tract.

Obersteiner has found the triangular tract in the medulla oblongata of tabetic subjects; Elsholge—in subjects who died of taboparalysis, progressive paralysis and cerebral tumors; Mingazzini and Perusini—in a case of Friedreich's disease. Yet in none of these cases is there any precise indication as regards the proximal end of the tract; in the last two cases its proximal end is claimed to have been at the level of the most distal part of the medulla oblongata and lateral to the pyramidal tract; the authors of these cases say that it was difficult to ascertain how much of this apparent tract represented peripheral degeneration and how much degeneration or rarification of the triangle properly speaking.

Recently Obersteiner published a case as follows: tumor of the floor of the fourth ventricle involving the right side; marked compression of the olivary body; descending degeneration of the triangular tract that could be followed downward to the beginning of the dorsal region of the spinal cord; in the cervical region of the spinal cord the degenerated area occupied exactly the

---

* Pick identifies Helweg's triangle with Löwenthal's anterior marginal tract (faisceau marginal antérieur). Pick: Ueber den fasciculus intermedius (Löwenthal), mit Bemerkungen über den fasciculus marginalis anterior (same author). Beiträge zur pathol. und pathol. Anatomie des Centralnervensystems, Berlin, 1898. Löwenthal. La région pyramidale de la capsule interne chez le chien et la constitution du cordon antéro-latéral de la moelle, *Revue medicale de la Suisse romande,* Sept. 15, 1886.

region of Helweg's area. In its dorsal side, however, an arcate prolongation penetrated from it into the lateral tract; at the periphery the triangular tract was separated by a layer of normal fibres. However, the case does not present any data for establishing the proximal origin of the triangular tract.

Thomas also claims to have seen descending degeneration of the fasciculus centralis tegmenti and of the area corresponding to Helweg's tract subsequent to a homolateral hemorrhage of the tegmentum; he says that the fasciculus centralis tegmenti consisted mostly of descending fibres which ended in the olivary body, while others probably formed part of Helweg's tract.

Finally there are some cases published in which the authors do not consider the areas of degeneration or rarification found by them as really representing Helweg's tract. In the description of his tract, in which he considered it as a vaso-motor path, Helweg identified it with the tract previously described by Westphal in two cases, localizing it at the transition line between the cervical spinal cord and the medulla oblongata. When speaking of the degeneration of this tract it would seem proper, therefore, to couple it with the name of the author who first called attention to it. Helweg does not say, however, that Westphal did not feel himself authorized to ascribe a pathologic significance to the zone composed of fine and very fine fibres (so halte ich nicht nach sorgfaltingster Pruefung vorlaufing nicht fuer berechtigt, diesem Befunde eine pathologische Bedeutung zuzuschreiben).

Obersteiner holds that Helweg's triangle corresponds to the area of degeneration described by Meyer before Helweg published his case of hemorrhage into the tegmentum at the level of the nucleus of the seventh pair. The degeneration extended down to the third cervical segment. It seems to me, however, that this position does not exactly correspond to Helweg's area. At the level of decussation of the sensory tracts the surface of the section is triangular in shape (Meyer, fig. 11), but is situated behind the compact pyramidal tract, with its base turned to the periphery of the spinal cord, its apex touching the longitudinal fissure. At the level of decussation of the motor tracts the small triangular area is situated at the periphery of the lateral column, limited by the anterior roots. In fig. 12, it is presented rather as being in a condition of rarification, and is separated from the periphery by a thin layer of closely set fibers.

Spiller described a tract that underwent descending degeneration subsequent to hemorrhage of the cerebral hemisphere, and which, according to Obersteiner, might present homolateral descending degeneration of the triangular tract. It seems to me that

such a possibility should be excluded. At the level of issue of the fifth pair this tract is lateral to the pyramidal tract, then directed abruptly behind and downward across the trapezoid body; at the point of junction with the medulla oblongata it takes a lateral position—above the bulbar olive ("a position lateral to the uppermost portion of the inferior olive"). Where the olive has its fullest dimensions, however, the tract is situated at the postero-lateral side of the olive itself (Spiller, fig. 8), while Helweg's area is situated at the externo-lateral side of the olive. In the medulla oblongata Helweg's zone is more anterior than is indicated by Spiller.

The tract described by Spiller represents a direct lateral pyramidal path.* It is more probable, on the contrary, that Helweg's tract corresponds to that described by Russel.**

When Hoche published his cases of paralytics in which he found descending degeneration of the pyramidal tracts and of Gowers' column, Obersteiner agreed with Pick that probably Helweg's tract was mistaken for Gowers' column.

From the facts considered it seems that there are no positive data in literature as regards the proximal origin of Helweg's tract; it is certain that proximally the tract is near the olivary nucleus, but it does not follow from this either that it originates or terminates in this nucleus. Obersteiner justly remarks, therefore, that the only way to resolve this question is to study true degeneration of this tract; and my case here described presents a true degeneration; it shows that Helweg's tract assumes the form of a groove, a little before the beginning of the distal end of the olive, within which the bulbar olive spreads out and is embraced in its external half. In horizontal sections it appears semi-circular, starting from the lateral end of the *oliva accessoria medialis,* turns at first externally, then outward and backward, finally abruptly inward, ending at the middle of the dorsal leaflet of the bulbar olive.

The tract disappears, or commences, inside the bulbar olive, in its lower two-thirds; in its most proximal part there is no trace whatever of the tract.

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* See Stewart Purves. Degeneration following a traumatic lesion of the spinal cord, with an account of a tract in the cervical region, *Brain,* II, p. 222.

Barness Stanley. Degeneration in hemiplegia, with special reference to a ventro-lateral pyramidal tract, the accessory fillet and Pick's bundle, *Brain,* II, p. 463.

** *Brain,* p. 145.

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Rome, Italy, June 1906.

A CASE OF HYSTERIA SIMULATING THE SYNDROME OF BROWN-SÉQUARD.

By Dr. Pietro Timpano.

It is well known that hysteria may manifest itself under various clinical forms, even assuming aspects of organic diseases caused by organic cerebro-spinal, circulatory, respiratory or other lesions. The practitioner is frequently confronted with such cases, and their diagnosis is so much the more difficult when the subjects thus afflicted do not present any stigmata of hysteria or hereditary neuropathic traits; indeed some such subjects do not present any neurotic traits of hereditary or acquired nature that could aid in the diagnosis of their affections. The physician is often so much misled in the diagnosis of such cases that he makes his diagnosis on the basis of an organic lesion and institutes treatment accordingly; the inefficatiousness of a prolonged treatment of this kind that puts the physician on his guard is often the main factor in leading him to make a correct diagnosis. To-day hysteria is recognized as being a proteiform neurosis *par excellence.*

The case that I shall relate below is descriptive of hysteria that simulated classically Brown-Séquard's syndrome (caused, as is known, by hemisection of the spinal cord).

The patient, A. S., was a peasant girl, 20 years old, born in Bova, Italy. Her father enjoys excellent health, has never indulged in alcoholic drinks or in smoking, and his conduct has alway been that of a normal man. The mother, on the contrary, presents some stigmata of hysteria: narrowing of the visual field, complete absence of the pharyngeal reflex and hypoesthesia of the left side of the body. She is highly irritable and excitable, the slightest worry causing her to have a convulsive fit. The patient is the only child she has had; the pregnancy was normal in every respect.

The patient menstruated for the first time when 13 years old. When 18 years of age she had typhoid fever, and during convalescence from this disease she first presented marked changes in her character: when reprimanded she showed excessive anger and refused to speak or to eat during such days. Since the attack of typhoid fever she became highly excitable and irritable. January 12, 1906, while sitting in front of her house, two men ran by, fighting, one plunging a knife into the back of the other. Frightened by the sight of the assault, she got up and tried to run into the house; she only made a few steps, however, and fell senseless. She remained so for some time before her mother and cousin found her still lying senseless—on her right side. She was picked up and carried to her bed, where she remained in a semi-conscious condition for over a month: her eyelids were half closed, the eyes turned upward and the respiration was stertorous. Her parents succeeded, however, in making her tell what had happened to her. In a low tone of voice she said that the sight of the two fighting men had frightened her, that she tried to run into the house, but that she had fallen, powerless to proceed. When somewhat reassured, she tried to turn in her bed, but found that her left lower limb was paralyzed. I was then called in to see her.

Objective Examination.—The patient is of medium stature, normal muscular and adipose development and rather pale. She has right plagiocephaly, narrow and slanting forehead. Wildermuth's ears. Normal and well-developed teeth; the hard palate is rather high and narrow. The thorax is well formed, but the breasts are underdeveloped; the abdomen is rather flat and the pelvis quite narrow; the limbs are well formed; when the patient is lying on her back, the lower left limb is turned outward. The heart and lungs are normal, although the pulse is somewhat rapid. The stomach, liver and spleen seem to be normal.

General Sensibility.—Tactile, dolorific and thermic anesthesia of the entire right lower limb and that part of the right side of the body which is limited by the median line and one passing eight centimeters above the umbilicus. The anesthesia is absolute only in the limb, up to its root, and diminishes in intensity higher up. There is no zone of hyperesthesia and the muscular sense is normal. On the left side general sensibility is normal, except for a zone of hypoesthesia, the size of the palm of the hand, situated in the middle of the anterior thorax. There is also a zone of hyperesthesia in the left lower limb, extending from the knee to the ankle; the muscular sense is considerably impaired in the entire limb.

SPECIAL SENSIBILITY.—The sense of taste, olfactory sense and hearing are normal. The visual field is concentrically narrowed on both sides, but more on the right side. Visual acuteness is normal. Dyschromotopsia for green only.

MOTILITY.—No disturbance of the facial, ocular, lingual, laryngeal or pharyngeal muscles. Active and passive muscular movements of the upper limbs normal. Muscular strength is somewhat impaired in the left upper limb. Fine tremors of the hands when extended. Complete paralysis of the left lower limb, its muscles being in a condition of hypotonia; passive movements are easily made. When made to walk the patient drags her lower limb, but the right one is normal.

REFLEXES.—Pupillary reaction to light and accommodation is more marked on the left than on the right, but the pupils are of equal size on both sides. The pharyngeal reflex is absent. The abdominal reflex is impaired. Knee reflex—marked on the left, but impaired on the right side. Plantar reflex abolished on the right and only slight on the left side. Foot clonus abolished.

PSYCHIC EXAMINATION.—The patient is somewhat depressed and preoccupied. No trouble in articulated speech. She is conscious of her surroundings in every way and has neither delusions, illusions nor hallucinations. Memory normal, although ideation is somewhat slow. The patient admits that she is afraid of catching diseases (nosophobia) and of remaining in the house where she lives (topophobia). Affective sphere normal. Instincts normal.

Summary of the symptoms:

On the right: tactile, dolorific and thermic hemianesthesia of the lower limb and that part of the body which is limited by the middle line and that passing eight centimeters above the umbilicus. Muscular sense normal. Reflex to light and accommodation normal; plantar reflex absent and knee reflex impaired. Active and passive movements normal in the upper and lower limbs, although there is a slight decrease of the muscular force of the upper limb.

On the left: hemiplegia of the entire lower limb. Tactile, dolorific and thermic sensibility normal; small area of hypoesthesia on the anterior thoracic wall, between the 4th and 5th ribs; a band of hyperesthesia in the paralyzed limb, extending from the knee to the ankle; muscular sense impaired in the entire lower limb. Reaction to light and accommodation more marked than on the right side; knee reflex marked; plantar reflex impaired.

The condition characterized by these symptoms is certainly analogous to that characterizing Brown-Séquard's syndrome:

hemiplegia on the side of the lesion and hemianesthesia on the opposite side. In the case of the patient, however, the symptoms set in suddenly, lasted twelve days and disappeared suddenly. Considering these facts, together with the patient's hysterical stigmata, the diagnosis of hysteria appears evident. If we were to point out an organic disturbance in this case it could be localized on the left side of the spinal cord, between the last thoracic and the first lumbar vertebræ. In this position a lesion would cause paralysis of the lower limb on the same and anesthesia on the opposite side. There would also be marked impairment of the muscular sense and hyperesthesia in the paralyzed limb, while the muscular sense would remain normal in the limb with anesthesia. The knee reflex would be more marked on the side of the lesion. It is true that in the classic syndrome of Brown-Séquard the symptomatology may be far more complex, but it is not always found to be such in all cases; in fact, in some instances only a few characteristic symptoms represent this syndrome. Hence in this case there are quite sufficient symptoms to constitute Brown-Séquard's syndrome. It is reasonable to suppose that in this case the functional disturbance that had caused the trouble brought about a local disturbance in the spinal cord, on its left side, between the last thoracic and the first lumbar vertebræ: this lesion caused an interruption of function of the pyramidal tracts, Gower's column, the direct cerebellar tract, etc.

The pathogenesis in this case can be explained on the basis of neurotic heredity on the mother's side, and the etiology must certainly have been the fright sustained by the patient, as has been stated above. As there was no organic lesion in this case, the mechanism of the pathogenesis is of interest. Clinical experience shows that the syndrome of Brown-Séquard may be caused by a lesion not necessarily involving the spinal cord properly speaking, but some region in its vicinity. Sciamanna (*Annali del'istituto psychiatrico della R. Università di Roma,* Vol. III, No. 1, 1904) published a case of this kind and called the syndrome *reflex syndrome* of Brown-Séquard, in contrast to the classic one caused by hemisection of the spinal cord. He claimed that with a lesion not involving the spinal cord properly speaking but in its vicinity, the corresponding half of the spinal cord could be actually affected as if it had sustained hemisection; the syndrome that followed was therefore quite like that found in the typical syndrome of Brown-Séquard. I also published a similar case in the JOURNAL OF MENTAL PATHOLOGY, Vol. VI, Nos. 3-4, 1904. Not all authors accept Sciamanna's explanation of the mechanism of the pathogenesis in such cases (functional local disturbances of reflex

nature); they prefer to explain the condition on the basis of inhibition of the perceptive centres.

In my case the reflex nature of the trouble should be excluded because no trauma had been inflicted directly or indirectly; the sudden emotion was the only causative agent. On seeing the assailant plunge the knife into the back of his victim the patient was so deeply impressed that she felt as if the blade were penetrating her own flesh in the region of her spinal cord. This vivid impression may have caused phenomena of inhibition in the motor and sensory cerebro-spinal centres of the limbs, causing paralysis and anesthesia as was described above. This case may, therefore, be termed as one of Brown-Séquard's *syndrome of psychic origin.*

While this patient had not sustained any trauma that might have caused the trouble of the spinal centres, it should be borne in mind that she fell while trying to run into the house. Yet whatever trauma her lower limb may have sustained in this fall, the apparent focal centre of injury cannot be explained by that trauma. In hysterical subjects a slight trauma of a limb may often be the cause of paralysis in the same; but in this case the trauma was received in the right limb, while the paralysis was located in the left one. The trauma may have caused the anesthesia recorded above, but taking all the symptoms together, it is more reasonable to suppose that the intense impression caused by the sight of the assault brought about inhibition of the motor and sensory centres of the lower limbs, causing Brown-Séquard's *syndrome of psychic origin.*

PHYSIOLOGIC EFFECTS FOLLOWING SUCCESSIVE ABLATION OF ONE FRONTAL LOBE AND ONE CEREBELLAR HEMISPHERE.

(*From the Laboratory of Neuropathology, Prof. Mingazzini, Rome, Italy.*)

By Prof. G. Mingazzini and Dr. Osv. Polimanti.

In this note we present our researches into the results following successive extirpation of one cerebellar hemisphere and one frontal lobe of the cerebrum either on the same or the opposite side. So far as we know we are the first to publish such researches.

Luciani and S. Sergi have published the results of extirpation of one cerebellar hemisphere preceded by extirpation of the Rolandic region on the opposite side. Our experiments were made on dogs, and we obtained the following results:

1. Extirpation of the frontal lobe (in dogs—the entire part of the cerebral hemisphere in front of the sigmoid gyrus) is always followed by the symptoms described by Munk: tendency to turn from the healthy to the side on which the operation took place (manœuvre movement); we also observed slight ataxia of the anterior limb on the side opposite to that on which the extirpation took place; when this ablation is followed by hemicerebellar ablation on the same side the operation is followed not only by ataxia and asthenia homolateral with the cerebellar (and frontal) side, but there is also an aggravation of the ataxia (that followed the previous operation) in the anterior limb on the opposite side.

2. Ablation of the frontal lobe on the same side on which one cerebellar hemisphere had been previously extirpated is followed by increased ataxia and asthenia of the limbs on the same side on which the ablation had been performed as well as by quite marked ataxia (incoordination) of the anterior limb on the opposite side.

3. Ablation of one cerebellar hemisphere on the side opposite to that on which the frontal lobe had been extirpated is followed not only by asthenia and ataxia of the limb on the same side on which the cerebellum had been destroyed, but the ataxia and asthenia that has already been caused in the same limb by the extirpation of the frontal lobe is markedly increased.

4. Ablation of the frontal lobe in a dog which had already sustained extirpation of the cerebellar hemisphere on the opposite side is followed by aggravation of the ataxic and asthenic symptoms of the side opposite to that on which the cerebellar hemisphere had previously been extirpated.

Homolateral hemi-fronto-cerebellar extirpation is followed by ataxia and asthenia in both sides of the body, but is more marked on the side of the extirpation; the animal presents syndromic manifestations quite similar to those following bilateral extirpation of the cerebellum. Contra-lateral hemi-fronto-cerebellar extirpation is followed by ataxia and asthenia on one side only—that on which the cerebellar extirpation is performed; and these disturbances are far more marked than those following isolated hemi-frontal or hemi-cerebellar extirpation.

Hence, if extirpation of one frontal lobe causes slight ataxic and asthenic disturbances of the anterior limb on the side opposite to that on which the operation is performed, disturbances similar to those following unilateral extirpation of the cerebellum, and if extirpation of one frontal lobe, on the same side on which the cerebellar hemisphere had previously been extirpated, augments the ataxic disturbances that have already existed and causes them to appear, although in a minor degree, on the opposite side, the conclusion seems to be that the frontal lobe has, not a direct, but an indirect action on coordinate movements of the limbs on the opposite side; the ataxic and asthenic symptoms that we have observed under the various conditions differed only in degree from those caused by cerebellar ablation. Everything points to the fact that each frontal lobe has an influence on coordination of movements of the limbs on the opposite side and particularly on the anterior limb.

Some authors interpret the ataxic symptoms that follow ablation of the frontal lobe as an effect *à distance* on the cerebellar hemisphere on the corresponding side. This does not seem to us to be correct, because then only the limbs on the same side should present ataxic disturbances, whether the frontal ablation preceded or followed the cerebellar ablation; besides, the disturbances should then be only transitory. But frontal ablation after cerebellar extirpation on the opposite side causes aggravation of the ataxic symptoms (incoordination) on the opposite side (on the same side on which the disturbances had been caused by cerebellar ablation); similarly, frontal ablation on the same side on which cerebellar ablation has existed causes bilateral symptoms similar to those caused by complete cerebellar ablation.

THE GENESIS OF SEX.

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This paper is practically an introduction to my paper "The Genesis of Genius," published in the Journal of Mental Pathology, Vol. VII, No. 5.

General Considerations.—Researches into the cause of sex determination have been made by various investigators, but so far little light has been thrown on the subject. Shenk's theory, based on the dietetic principle, created quite a sensation, but unfortunately the medical profession at large has not investigated the subject with any perseverance, and no definite conclusions as to the merit of his claims have been reached.

The drawback to the progress of this investigation is our indifference to it. Many of us shrug our shoulders when the importance of the question is presented to us, and we readily fall into line with those who say that nature is taking proper care of the proportion of men and women to be brought into the world. From the gross point of view, the natural equality of distribution of the sexes leaves nothing to be desired. Certainly, if all other conditions of life harmonized with an even proportion of the sexes, we should be justified in our indifference and in the acceptation of the dictum of the conservatives who claim that the equal proportion of the sexes as provided by nature is a wonderful provision that should meet with our respect.

Unfortunately, the harmony that should exist is conspicuous by its absence. Indeed, the equal proportion of males and females

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provided by nature is the main cause of a constant and continuous superfluity of one sex, as we shall show, and such a division of the sexes is intended for a society far different in structure than is that peopling the earth. Take, for instance, the uncivilized peoples, who, like ourselves, enjoy the provision of nature whereby 50% more or less, of each sex is born, and consider what becomes of the feminine moiety of their respective populations. A large number of the baby-girls are either drowned or strangled at the time of birth, or else, if allowed to live, are sold at tender ages as slaves, or worse.

What concerns us most directly in the consideration of this subject, however, is the fact that mothers, families, societies and nations that currently kill their baby-girls or sell them when grown up give nature the lie, so to speak. The aim of such peoples is apparently to relieve themselves of a heavy burden that female children bring into households, and probably also to save their female offspring an unbearable burden that awaits them at mature age. It seems, therefore, that the wisdom of nature, in providing an equal division of the sexes, a division that dogmatists caution us against questioning, is most questionable in the light of conditions that obtain among the infanticidal peoples.

The reader will perhaps say that the Eastern peoples, which find themselves overburdened with one sex, are no criteria for us,—that civilization is gradually leading to social improvements and sacredness of individuality, and that any attempt at artificial increase or decrease of one or the other of the sexes is a violation of nature's provision which we should not countenance.

If it be true that civilization is working improvements for society at large, it remains also true, nevertheless, that civilized society also suffers from superfluity of the feminine sex. I refer the reader to my paper entitled "Remarks on a Specific Human Energy and its Economic and Social Significance", in the Journal of Mental Pathology, Vol. VII, No. 3, 1905, p. 123, in which the following statements regarding the excess of women over men in England is made:

"In plain English, there is in England at the present moment a sex 'famine', which, unless the ladies are exported in millions, is likely to increase rather than diminish", etc.

Polygamy is also mentioned as a means for counteracting the overabundance of the female sex. It has seriously been suggested that the superfluous Englishwomen be exported to Japan, thus helping to raise the standard of the Japanese stature. It is worthy of note that no English country or other country to which one would presume Englishmen have emigrated, is suggested as

the proper place for this export. The reason that no such suggestion is made is that there is no superfluity of Englishmen anywhere.

These data show, therefore, that while civilization is causing betterment of society and abolishing wholesale strangling of female offspring, the facts remain, nevertheless, that the civilized, like the uncivilized nations, have their superfluity of women.

Among the civilized countries, England does not stand alone in having a superfluity of women. Indeed, according to Frau Gnauck-Kuehne, there is a superfluity of women in many European countries. And while the excess of women over men abroad is probably the result of necessity (economic and social conditions) our own "bachelor girl" is the result of her free choice, but directed by the same conditions—economic and social, but which spell necessity elsewhere.

I shall not stop to consider these interesting questions, but shall pursue the thread of the argument regarding nature's mathematical provision of the proportion of the two sexes and consider whether we are justified in shrinking from the study of the genesis of the sexes—with a view to controlling the proportion of male and female births.

So far as unprejudiced reasoning dictates, there is not only ample justification for such a study, but even an important necessity for it. Indeed, it should not be considered natural for human society to have an excess of one sex, leading to wholesale infanticide among the less civilized nations, and to a living superfluity of the same sex among the more civilized nations. No argument can blind us to the fact that a superfluity of the female sex exists among all peoples—whether civilized or uncivilized. For, as we know, nowhere is there any corresponding excess of the male sex to the extent of prompting alarmists to plead for legitimate polyandry, in analogy to legitimate polygamy in order to counteract a "sex famine". There may be a few remote farms in the backwoods of some countries, where a larger influx of women would be desirable, but certainly the "sex famine" in those supposed farms is a negligible quantity when compared with the marked superfluity of women from which, we are told, England is suffering to-day.

Whence comes the superfluity of women—in face of nature's wise division of the sex proportion?

Those who would reply that the constant emigration of men from England explains the disproportion in that country between the number of men and women respectively are mis-

calculating. Yet, how is one to explain the apparent paradox: an equal number of births for males and females, and a resultant superfluity of women over men? The riddle is not impossible of solution. Indeed, economic conditions that must govern all peoples explain this artificial result. Experience has led society to realize that it is important for a man to reach maturity—in age, work and capability—before he can honorably claim a woman as his mate. The Greeks made it difficult for a man to enter the married state before the age of thirty. To-day, the same conditions, self imposed, obtain in this and in other civilized countires. The question of age at the time of marriage is considered, from a different point of view, in my paper mentioned above, and in Prof. Marro's work tables are adduced showing that the higher a nation's civilization, the higher is the average age at which man marries. In the most progressive countries of to-day the majority of men marry at the age of from 30 to 35 years. A man of from 30 to 35 years of age seldom marries a woman of similar age; he is most apt to chose a woman younger than himself. Now, for the sake of argument, let us suppose that we have established a town artificially, in which civilization is exactly like our own, that we have peopled it according to current birth rates provided by nature, putting into that town an equal number of males and females respectively, but in which the oldest men and women are from 30 to 35 years of age. In order to make of this population an exact counterpart of what it would be if it constituted a certain percentage of an ordinary highly civilized nation, we should suppose that male youths and those less than 30 to 35 years old are unmarried. In fact, let us suppose that our artificial community, constructed by us according to nature's provision of 50% of each sex, and civilization's restriction of the age at which man may honorably marry, is to celebrate to-day for the first time in its existence marriages among its citizens. According to the conditions imposed on us by civilization, the eligible men for marriage are only those between 30 and 35 years of age. Let us suppose further that the population consists of 800 males and 800 females in the following proportions:

Men.	Age.	Women.	Age.
200.	Under 20.	200.	Under 20.
200.	20-25.	200.	20-25.
200.	25-30.	200.	25-30.
200.	30-35.	200.	30-35.

Let us suppose now that the first men to enter the married

state are those between 30 and 35 years of age. Barring all exceptions, these men will surely choose in marriage the women younger than themselves, in either of the three groups of women comprising subjects between the ages under 20 and not above 30. Hence, in this small community of 800 males and 800 females, the marriage of the first 200 eligible males is followed by a superfluity of two hundred women. That these women, between 30 and 35 years of age enter into the category of the superfluous goes without saying.

The above schema shows that a marked superfluity of women may exist even when the absolute proportion of the two sexes is equal,—50% of each. Although the schema is artificial, it corresponds pretty well to what takes place in a population of vaster numbers. It is not necessary to consider here the absolute superfluity in the number of women as it is said to exist in some countries, as the proposition considered here is that the 50% of each sex provided by nature leads to a superfluity of women in societies; yet the morality of the latter should be built by both sexes equally as both are engaged in the struggle for existence. Although the number of superfluous women is exaggerated in the schema for the sake of demonstration, it nevertheless represents exactly the conditions that prevail in natural communities millions of times larger in number than 800. For it should be borne in mind that men and women of the same generation live and die within the same period of years. Consequently, every generation starts its own superfluity of women and dies with it. It seems unnecessary to stop to demonstrate here that there are still other factors contributing to superfluity of women, such as the frequent marriages of senile widowers with very young girls, and of widows with single men. But the argument presented here, showing that nature's equal supply of men and women respectively leads to superfluity of women, is sufficiently clear to need any further consideration. Economic and social factors help to upset nature's equilibrium in the proportion of the sexes by causing superfluity of women—both in the civilized and uncivilized countries. The only difference in the reaction of the respective countries against this condition is in form: among the uncivilized peoples the reproach to nature is expressed by wholesale infanticide of females, while among the Europeans superfluous womankind is either moping or conquering for itself a prominent position in the domain of hysteria; and last, but not least, our own "bachelor girl," with her innate sense of individuality, clear appreciation of existing facts and her high

demand on manhood, towers far above her sisters abroad in that she is the chooser rather than the unwilling acceptor of her civil state.

From the point of view just examined, it would be of advantage to learn how to control the genesis of the sexes. The application of such knowledge should be valuable in many practical ways, of which only a few may be touched upon here: it is not right, for instance, to regard with equanimity the wholesale slaughter of infants because of sex; nor to treat with indifference the melancholic superfluous woman of Europe, who is brought up to believe that she is disgraced unless she can become the wife of some man or of any man; and it is not right to tolerate conditions which, by reason of superfluity of women, greatly contribute to the existence of the horrible triad—syphilis, gonorrhea and alcoholism—with the consequent increase of insanity, criminality and degradation of nations (1).

From whatever point of view the question of superfluity of women is considered, it appears that sexual profligacy in man—with its long list of consequent social evils is the result therefrom. After all, the question of the government of sex differs from that of the government of state only in kind: tyranny or excess in either leads to individual degradation and collective decay. The only effective remedy for such evil is to learn how to control the conditions that lead to surplus of sex, in the same manner as one would seek to curb the tyranny of power or the centralization of capital.

Those who inherently adhere to inertia in thought may say that probably nature has some aim in providing conditions that lead to superfluity of one sex, and that besides, the discovery of an anti-syphilitic and anti-gonorrheal serum would invalidate the argument pleading against sexual profligacy in man. That such a discovery will soon be made is not only most probable but is earnestly to be hoped for, but not if it be meant to foster and encourage sexual excess. For the function of sex, like all other physiologic functions, requires moderation, and any excess imposed on it spells degradation—individual as well as collective. This is particularly true as applied to sexual function of man, in whom it is almost inseparable from that of reproduction. And as "reproduction is essentially a process of nutrition" (2), involving the entire cellular mass of the system, overindulgence by man in sexual function results in undermining of his system. For, according to Hermann, (quoted by Dr. Mary Putnam Jacobi, in "The Question of Rest for Women During Menstruation," p.

168), the ordinary cost of reproduction is the same in both sexes. The history of nations is amply illustrative of the fact that national decline and extinction has always followed on the trail of conditions that brought about current sexual excess.

Public ignorance of the physiology of the human system and especially of the function of sex is largely responsible for sexual excesses among men. But medical men are waking up to this fact and it is not rare now-a-days to find frequent statements in the medical press that sexual continence is not only harmless but beneficial in many cases (3). *American Medicine,* July 1, 1905, remarks editorially, in part that "it should be an easy matter to convince the developed man that continence can be a normal state for civilized man. The ordinary excretions can be explained as normal phenomena which are absolutely harmless, if not beneficial. They, of themselves, occurring as they do in sleep, are sufficient to prevent degeneration of the sexual apparatus from disuse, and, indeed, there is no evidence at all that continence, even without these phenomena, ever results in harm. All this instruction, together with a complete study of the anatomy and physiology of the sexual system, is not only proper but is an essential part of a high-school education, though it should be in the hands of physicians. . . . In time, the surviving civilized bachelors will be continent through the elimination of all others, but it is a long way off." Professor Marro, in his work "La Puberté chez l'Homme et chez la Femme," justly remarks that mental work is a hypnotizer against sexual appetite, or an anaphrodisic agent. But the millions of people, whose mentality is not called into any particular active play are the incontinent who are furnishing renewed vigor for the growth of the black plagues syphilis and gonorrhea. Indeed, according to *American Medicine,* January 6, 1906, p. 2, the enormous number of cases of these diseases is yearly rising. "It is said that of the 770,000 male Americans who reach early maturity every year, 60%—nearly one-half of a million—will become infected before they are thirty. Many of these men marry before they are cured, and the infection of wives follows, causing 80% of deaths from female inflammatory troubles, 50% of gynecologic operations, and 80% of infantile blindness. . . . The trend of civilization seems to be in the direction of restricting the social evil by elimination of its devotees."

It should be borne in mind that the evil lies not in the superfluity of unmarried women, but in the increased sexual immorality of man that feeds on this disproportion or superfluity. If science can discover a way of controlling the birth of the sexes,

it is our first duty to bring such a discovery to light. There is too great a disproportion between happiness that *is* and happiness that *should be* the heritage of humanity. And an intelligent control of the genesis of the sexes may help to bring about a golden medium in human happiness.

Of course, it is possible that the mysterious working we are pleased to ascribe to nature may, in the long run, accomplish a readjustment of the proportion of the sexes; but it seems that civilization is taking hold of this enterprise. Thus, for instance, according to Frau Gnauck-Kuehne, the superfluity of women in so many European countries is rapidly disappearing, and in another twenty years there will be a superfluity of men even in such countries as Germany and England, where at the present time women preponderate. In Luxembourg, in 1890, there were 1,002 women for every 1,000 men, whereas there are now only 999 women for every 1,000 men. In Austria, the proportion has been reduced in the same time from 1,044 to 1,035; in Hungary, from 1,015 to 1,009; in Switzerland, from 1,057 to 1,035; in Sweden, from 1,065 to 1,049; in Germany, from 1,040 to 1,032; in England, from 1,055 to 1,047 (4).

If the above figures represent existing facts, they seem to convey some interesting items for study. Indeed, according to this author, the gradual reduction of the proportion of women to men is most marked in "advanced" countries. The question suggests itself,—what special conditions are there in advanced countries that may possibly contribute to such a reduction? In an advanced country the main features are necessarily higher national mentality and higher neuro-muscular force than in countries that are not advanced. Is it not probable, therefore, that high neuro-muscular vigor has an effect on the genesis of the sexes—in favor of male births? There is still another special condition in advanced countries that contributes to heightened neuro-muscular vitality of parents. As is well known, in advanced countries both men and women marry at a later age than do people in countries that are not advanced. Prof. Marro (5), presents an interesting table showing the ages at which marriages take place in different countries. Russia heads all other European nations with the maximum of men and women who marry under 20 years of age, (32.01 per 1,000 men, and 56.35 per 1,000 women). There is no parallel to these figures in marriages of any civilized nations. In all the other countries examined the majority of men marry between the ages of from 25 to 30 years, and barring Russia and Buenos Ayres, the majority of women marry between 20 and 25 years of age. Besides, the number of women

marrying between 25 and 30 years of age is minimum in Russia (6.94 per 1,000) as compared with the figures for other countries, in which the lowest is 12.41 per 1,000 for Buenos Ayres, and the highest—31.37 per 1,000 for Sweden.

I shall consider in another paper the importance of these figures in so far as they bear on the neuro-muscular vigor in the offspring (*). For our present purpose it suffices to remark that the figures show that in countries of high mentality procreation is commenced at a period when both men and women are at the height of neuro-muscular vigor. Confronting this fact with the statement in regard to the decrease of female births in advanced countries, it again seems reasonable to suppose that the determination of male births depends on the height of neuro-muscular vigor of the parents at the time of conception of their offspring.

That male births depend on high neuro-muscular potentiality may also be inferred from the fact that college-bred women give birth to more male children (55%) than do non-college-bred women (45%) as was demonstrated in my paper "Remarks on a Specific Human Energy and Its Economic and Social Significance" (6). In that paper it is stated that college-bred women marry later in life than do non-college-bred women, and that the college-bred women marry educated and professional men more than do the non-college bred women.

While this proposition is not improbable, we have not any sufficient material in scientific literature to warrant a positive conclusion in its favor. From the fragmentary data bearing on the subject it may be concluded, however, that there is a correlation between potential cellular energy of the parents and the genesis of the sexes. Besides the theory I have presented as regards such a correlation, I venture to suggest one more point in its favor: I refer to the correlation that probably exists between the date during the intermenstrual period at which conception takes place and the probable sex of the child. I shall show later on that cellular potential energy of woman is at its maximum about ten days before the onset of the menstrual flow and that this maximum potential energy is probably a cause in the determination of male issues of conceptions taking place at that period.

Some of our profession scoff at the idea of the probable relation between the date during the intermenstrual period at which conception takes place and the sex of the issue. Others, however, think that the later in intermenstrual period conception takes

* See my paper entitled "The Genesis of Genius," published in The Journal of Mental Pathology, Vol. VII, No. 5, 1906.

place, the more chance is there of the birth of a boy. Indeed, Prof. A. Marro states, in his work already mentioned, p. 521, that when conception does take place at such a period it results most frequently in the birth of a male child.

The only statistical support in favor of this theory seems to me to be in the fact that the Jews, whose religion forbids marital intercourse during the period of five days preceding and ending with the seventh day after the menstrual flow (7) give birth to more male than female children. In the United States , where no statement regarding the religion of the new-born is required by the authorities, we have no means of verifying the claim; Dr. A. Giannelli's (8) statement that Mayer and Salvioni's data on this subject are not verified in the Province of Rome, where, according to the census of 1901, there were more Jewish women than men, needs elucidation; what is of importance to examine is the birth rate as regards sex among the Jews, not the census. The constant and heavy emigration that is going on in Italy may account for the preponderance of Jewish women in the Province of Rome. Hence, until it is disproven that Jews give birth to more male than female children, we are justified in pursuing the thread of the argument tending to show that high neuro-muscular vigor of woman is probably a factor in the genesis of the male sex. It is probable that high neuro-muscular vigor in the male parent is also a factor in the determination of the male sex. Unfortunately, we have no researches bearing on the cyclic physiologic changes in man corresponding to that in woman. So that for the present, one is forced to theorize on the ground of the data in question relating to woman only.

The physiologic conditions of woman during the intermenstrual period become of especial importance for consideration in the light of the correlation between her cellular potentiality governed by them and the sex of the issue of conceptions taking place during these various stages. In view of the apparent correlation between the time of conception during the intermenstrual period and the birth of male children, as I have shown above, the study of this cellular potentiality deserves particular consideration.

Physiologic Considerations.—In 1886, Dr. Mary Putnam Jacobi presented her masterly experimental researches into the rhythmic variations of the physiologic status of woman during reproductive life (9). She demonstrated that "..... *reproduction in the human female is not intermittent, but incessant, not periodical, but rhythmic, not dependent on the volitions of animal life, but as involuntary and inevitable as are all the phenomena of nutritive life*" (p. 165).

The mechanism by which provision is made for the material required in this "incessant budding" (p. 167), of woman is explained by Dr. Mary Jacobi in the chapter dealing with supplemental nutrition, that is not cited here.

"In woman exists a rhythmic wave of plentitude and tension of the arterial system, at all events perceptible in the radial artery, which begins at a minimum point, from one to four days after the cessation of menstruation, and gradually rises to a maximum, either seven or eight days before menstruation, or at any day nearer than this, or even during the first day of the flow (p. 159).

"In all the detail examined, therefore, we find evidence of such a gradual but steady preparation for the menstrual hemorrhage, as should exclude the idea that this, when normal, has any tendency to deplete the nutrition or lower the strength. It is to be regarded as the simple equivalent of an accumulation effected by a constantly rising wave of nutrition, primarily (in all probability), affecting the blood, but secondarily, and as a result accidental to the main object of the wave, affecting the nervous and muscular system through which that blood circulates. The blood of the woman, non-pregnant, as well as pregnant, *maintains constant provision for the nutrition of offspring,* just as the sap of the tree contains constant provision for the nutrition of buds.

"The special variations of this blood, *i e.,* as regards sex, are all relative to this circumstance, but incidentally, the nutrition of the woman's own organs is affected.

"If rich blood circulates in a slightly increased quantity, and under a higher pressure, through the neuro-muscular organs, the nutritive movements in their tissues are accelerated, and the acceleration is marked by the increase of urea. When, in virtue of the rhythmic movement inherent in their form of nutrition, a portion of the nutritive fluids of woman becomes in excess of their individual needs, this excess begins to accumulate in the circulation, until finally, the tension becoming excessive, the closed system gives way at its weakest point, the blood vessels of the fattily degenerated uterine decidua, and hemorrhage occurs.

"We find that in the majority of cases, the excretion of urea is increased during the few days preceding menstruation, over that of the intermenstrual period; that it decreases during the menstrual flow, and is at its minimum just afterward; that the pulse shows no uniform rate of variation, but that the temperature rises just before menstruation, to fall during the flow, but at this time rarely reaching the point of the intermenstrual period.

Finally, that the sphygmographic trace shows a constantly increasing rise of arterial tension from a minimum point reached just after menstruation to a maximum point just before, but rapidly lessened during the menstrual flow" (p. 162).

"In the majority of women, the week preceding menstruation is a period of increased vigor and consciousness of increased nervo-muscular strength" (p. 162).

"The increased excretion of urea observed in the majority of cases at the premenstrual period implies an increased movement of nutrition, although not very marked" (p. 164).

"The rise in temperature indicates the same curve of oxidations as the alterations in the amount of urea, and again, we are led to suspect as a probable proximate cause, an increase in the number of blood corpuscles.

"Finally, the rise of the tension as indicated by the sphygmographic trace, seems to intimate, for the reason above given, an increase in the mass of the circulating fluid" (p. 164).

Inspired by Dr. Mary Jacobi's work, I took up the study of variation in the number of blood corpuscles in woman during the intermenstrual period. Some of these studies were made by me in Dr. Jacobi's office, at her invitation, while others were pursued with various interruptions while I was resident physician in the Maternity and Philadelphia Hospitals, in Philadelphia, and in the New York Hospitals for the Insane, in New York.

From the point of view here considered, such a study should be made systematically and without interruption—conditions that unfortunately did not prevail in my studies. Another condition of importance is the maintenance of an even diet and psychic status. All these conditions could not be controlled in the circumstances under which I had to work, and accurate results should not be expected under these conditions. With this reserve in view, I feel at liberty to state that while the number of the blood corpuscles did not present any characteristic rise and fall, a rhythmic increase and decrease is evident nevertheless during the entire intermenstrual period—as was foreseen by Dr. Mary Jacobi, the maximum corresponding to the period about a few days before the onset of the flow. The irregularities accompanying the curve depended on multiple causes, including changes of food and psychic influences.

Dr. Alfredo Salerni recently published a paper dealing with the periodic oscillations of the temperature, pulse and respiration of insane women during menstrual and amenorrheal life (10). It is regrettable that he was not guided by Dr. Mary Jacobi's indications on the subject in normal women and that he, therefore,

accepts certain views on the mechanism of menstruation that do not compare favorably with those presented by her. However, in his results of the points studied he concludes that the maximum vital energy, temperature, pulse and respiration of normal women is expressed one or two days before the onset of the menstrual flow and that there is an abrupt decrease of this energy below the normal after the onset of the flow.

From all these researches we are impressed with the fact that the maximum vital energy of woman exists a few days before the onset of the menstrual flow.

Before drawing the final conclusions suggested by the arguments adduced here, it may be useful to present Dr. Mary Jacobi's remark on the distinction between sexual and reproduction function in woman.

There is "....a widespread though unconscious perversion of view that has resulted from the habit of associating menstruation with the sexual function of women; and of expecting it to be accompanied by some especial excitement of the cerebro-spinal nervous system, such as must necessarily hold in abeyance all other activity of the central nervous organs.

"The suggestion so frequently made that by means of menstruation celibate women were enabled, to a certain extent, to compensate their celibacy, rests on the slenderest foundations. But we should assert that the menstrual process, peculiar to the one class of animals who are capable of avoiding or of missing an opportunity to propagate their species, indicates that this freedom of choice is only superficial or apparent, and that the initial steps of reproduction are being constantly, not periodically, taken by the force of nature, working independent of human will or of social accident. The woman buds as surely and as incessantly as the plant, continually generating not only the reproductive cell, but the nutritive material without which this would be useless, whether or no either be utilized in further development" (pp. 166-167).

It is necessary to bear in mind the distinction between sexual function and reproductive activity from the point of view of cellular potentiality on the basis of which I have developed the theory of sex determination. In Dr. Mary Jacobi's own words this distinction is most apparent, and we know that in human beings sexual excitability and function is provided only for the purpose of making reproduction possible. High sexual excitability, characteristic of abnormal conditions, in no wise corresponds to high cellular potentiality observed during the week or ten days preceding the menstrual flow. The subject with high

sexual excitability is far from enjoying a maximum of vital energy, as she generally is a neurasthenic or belongs to some other group of degenerates with a reduced cellular potentiality.

Hence, when we speak of vigorous cellular potentiality in its relation to the resulting sex—when conception takes place during such a propitious time, that cellular vigor has nothing in common with the degree of sexual excitability in woman.

Focussing our leading arguments together, therefore, we find the following propositions:

1. Woman's highest potential energies, during menstrual life, correspond to a period about ten days, more or less, before the onset of menstruation.

2. A male child is most apt to be the issue of a conception taking place at such a period.

3. The Jews, to whom marital intercourse is forbidden during the period comprised between the last five days preceding and the seven days following menstruation, give birth to more male than female children in comparative excess over other nations.

4. In advanced countries the superfluity of women is gradually dying away.

5. In advanced countries marriages take place at an age corresponding to the height of neuro-muscular vigor.

6. College-bred women marry later in life and marry educated and professional men; they give birth to more male children (55%) than do the non-college-bred women.(45%).

7. The only reasonable interpretation of these facts is that in advanced countries the level of mentality and neuro-muscular potentiality of parents is higher than in backward countries, and that this high potentiality must certainly have a decided effect on the decrease of female births.

8. If my supposition presented here, regarding the correspondence between the male issues and high cellular potentiality of the woman at the time of conception is correct, we have a valuable clue to the study of the genesis of the sexes.

9. If we were to acquire positive knowledge of this correlation, we should have a valuable means of controlling and directing the male and female population of the world.

Alarmists should not shrink from the thought of our becoming enabled to meddle with nature's sex apportionment; civilization and science gradually lead us into paths of wisdom and subtler utilities than the enertia of our mentality allows us to fathom.

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A MEDAL FOR DR. MAGNAN.

The colleagues and pupils of Dr. Magnan will present him with a gold medal on the occasion of his jubilee. One side of the medal will present, in *bas-relief,* Dr. Magnan leaning over a maniacal patient undergoing bed treatment. Dr. Magnan was the first to institute bed treatment for the maniacal insane in Paris,—and in France.

Dr. V. V. Vorobiev was shot by one of the militia while he was attending the wounded during the riots in Moscow, and died immediately.

TRANSLATIONS AND ABSTRACTS OF CURRENT LITERATURE.

Hygiene in the Russian Prisons.—In a letter to the *Muenchener Medizinische Wochenschrift,* September 18, 1906, Dr. A. Dworetzky writes from Moscow as follows below:

Prisons in Russia have become a remarkable actuality within the last year. Since the declaration of the Imperial Manifesto, October 30, 1905, granting popular suffrage and inviolability of person, there is hardly any respectable person here who has not been made to breathe prison air and to taste prison fare. During

the past year the number of existing prisons in Russia proved to be entirely insufficient, and since the declaration of the inviolability of person in Russian, the Government, deeply sensible of this want, has caused a number of new prisons to be built. The prisoners who filled these dungeons were a curious collection of humanity: Professors of colleges, physicians, lawyers, school teachers, engineers, mechanicians, railway employés, postal and telegraph operators, editors, journalists, writers, generals, priests, factory hands, typesetters, clerks, servants and an endless variety of other people. Series of delegations of various societies and unions, students of both sexes, pupils of conservatories, art schools, gymnasias and technical schools, etc., etc.

The chief evil in the sanitary conditions in the Russian prisons, thanks to the "constitutional" era of Mr. Durnovo and the "liberal" epoch of Mr. Stolypin, is their being terribly overcrowded. I do not refer here to the police prisons, overcrowded with all sorts of "political" offenders, where they are subjected to an existence unworthy of a human being. In each cell are huddled together as many persons as it can possibly hold; when the doors of such cells are opened, the prisoners tumble out. Under these circumstances there can be no question of the possibility of sitting or lying down, and the rare chance of finding standing room where one may lean against the wall is accepted with a grateful feeling.

The conditions in the large Government prisons are not much better. An approximate notion of the overcrowding may be gathered from the official report, according to which, at the end of April of this year, the Government prison was overcrowded to the extent of from 60 to 65 per cent. above its normal capacity. In the Wilna prison, with a capacity for 315 persons, 667 persons were housed; the Kovno prison, with accommodations for 447 persons, held 488 prisoners; the Kharkoff prison held 748 instead of 371—its fullest capacity; the Pskow prison, 300, instead of 175; Chernigov, 385, instead of 150; in the St. Petersburg prison, Peter-Paul, 1,062, instead of 798, etc., etc. The Saratov prison, with its maximum capacity for 460, was crowded with 1,068 persons.

Chronic overcrowding is not the only unsanitary evil in Russian prisons, as may be judged from Dr. Ssulima's letter, describing the prison "Kresty," built for solitary confinement and known as the St. Petersburg "model institution," where the Doctor had spent six months previous to being exiled to Archangel. Dr. Ssulima's letter was published in *Russky Vratch,* describing his personal experiences and sufferings of his own flesh while in that prison. The prison was overcrowded, harboring 1,000

persons—a number far above its normal capacity. As the number of single cells was far below that of the prisoners, each cell, built for solitary confinement, was crowded with two and even three political offenders. The prison fare is, according to Dr. Ssulima, wholly insufficient and the prisoners are victims of chronic hunger. Indeed, the allowance per capita, per day, is from 12 to 14 kopeks—before it goes through the hands of the administration. The bread, the prisoners' mainstay of food, is generally raw; during the six months of his confinement in this prison Dr. Ssulima tasted properly baked bread only twice. The pale faces and starved appearances of the emaciated bodies of the prisoners are eloquent and sad witnesses of the insufficiency and unwholesomeness of the prison food. The air rivals the food in foulness. Each cell is provided with one zinc, or tin pail, for use as a water closet; the pail is seldom provided with a suitable cover. In the morning when these "contrivances for the production of vitiated air" are carried out of the cells, a pestilential stench is diffused throughout the prison. These pails, when emptied, are brought back to the cells without ever being cleansed. On hot summer days the presence of these vessels makes the foulness of the air in the cells unbearable. The cells are never ventilated.

Tubercular subjects are mixed indiscriminately with the other prisoners, and when the daily sweeping of the cells, that are never disinfected, is practiced, there is added to the usual stench of the air an infected cloud of dust. A bottle containing a disinfectant solution may be found in the prison, but the substance is used only on such exceptional holidays as Easter; a tablespoonful of the solution is allowed for chosen cells! There can be no question of cleanliness as applied to the kitchen.

From the above description one may judge how defective are the hygienic conditions of prisons that are "model institutions." The "Transportation Prison," at Moscow, for instance, is wholly inadequate as regards hygienic conditions there; the general cells are swarming with vermin; wooden benches are used as beds, and placed so close together that there is space to pass through only between every four benches. The windows cannot be opened and there is no possibility of ventilation except when the window panes are broken. The asphalted floor is in a dilapidated condition and the holes in it, filled with dirt, are sources of infection, whether left dry or sprinkled with water to prevent the raising of clouds of dust when swept. Tuberculosis is rampant and the cells resound with the coughing of the tubercular prisoners. The sick prisoners far prefer to remain in these cells to being

transferred to the prison hospital, that is more repugnant in filth and dirt than the cells themselves; indeed, the hospital is a veritable cesspool.

Such are the conditions of the Main Government prisons! And the hygienic status of the provincial prisons may be judged from a protest presented by the inmates of the Tambov Government prison to the district attorney of that province:

" . . . our cell, with a maximum capacity for 20 persons, is harboring 32 persons; this overcrowding causes a damp and foul atmosphere in which we are forced to spend 23½ out of every 24 hours; in consequence of the foulness of the air the stronger of us suffer continuous headaches and the weaker frequently have fainting spells. The undermining of our systems is made still worse by the absolutely unbearable fare, devoid even of a minimum of nutritious substances; the bread is raw and only serves to provoke gastric derangements. Those who can afford to have food brought to them from outside are not allowed to do so, except twice a week. Boiled and fresh drinking water cannot always be had. The quality of the food and the nauseating filth in the kitchen where it is prepared, does away with any desire to partake of the meals. The absence of beds makes it necessary for us to sleep on the filthy and cold asphalt floor, and we are exposed to catching all sorts of diseases through exposure to this filth, cold and dampness. Two of our comrades had to be transferred to the hospital and three others need hospital treatment. The prison physician has confirmed the existence of these conditions. Bed linen is an unknown thing here, and the straw in the mattresses has been reduced to dust from long use. We are allowed to take a walk only for one-half hour a day, and the rest of the 23½ hours we are compelled to spend within the enclosure of cell walls, where there is no ventilation and the filth and dust are stifling. The political prisoners are compelled to empty the night chambers and slop pails . . ."

There are no recreation hours for the prisoners. The discipline is rigid, and applied by force of club law. The reader will perhaps ask: "What does the prison physician do about this? Why does he not recommend the introduction of indispensable sanitary improvements?" But such a display of professional concern cost Dr. Fink, of the Tambov prison, his position. His post was then bestowed on a sort of male nurse.

Such are the conditions in the major prisons. The sanitary status prevailing in the police prisons may be judged from the protocol of the Baku province physician, Dr. Alichanov: Sixty-three men were put into four rooms and all the women prisoners

were crowded into one room. The walls in all these rooms were filthy and covered with expectorated matter; dust and cobwebs met the glance everywhere, and the air is foul and stifling. The prisoners lie upon the floor, as there are only eight beds in all and no benches. The food is extremely unwholesome and insufficient. The expense per prisoner per day is 12 kopeks, of which 9 are allowed for his bread. The kitchen is dark, filthy and utterly inadequate for the purpose. The copperware is in bad condition and covered with verdigris. There are no cups, glasses or other appropriate utensils for handling water; instead are used discarded tin cans. No baths are allowed the prisoners.

In the reports of the Orel prisons it is stated that they are terribly overcrowded; the cells are damp, dirty, and in consequence the prisoners are falling victims to various diseases. One of them, Dr. Ispolatow, was dying.

I could cite a series of other documents and authentic facts on the sanitary status of the Russian prisons, but I believe that what has been cited suffices. The reader is sufficiently enlightened as to the conditions under which political prisoners are compelled to exist; their offenses, in the majority of cases, are: participation in a strike, demonstration or meeting, carrying about political pamphlets, or at the most a revolver was found at the offender's home when searched by the police. Many of these prisoners were arrested simply because they were suspected of being political offenders, although no evidence was found to justify the suspicion. Many prisoners are entirely innocent of any offense and are unable to explain even to themselves the cause of their arrest and of their doom to remain in prison apparently indefinitely. Many prisoners, under the stress and strain of the unbearable prison conditions, become nervous wrecks and often revolt against the prison officials. Every offense of a prisoner is promptly followed by punishment, which consists of forbidding him to receive friends, to take the daily walks, to read, to write, or he may be put in a dark cell, etc. The punishment meted out is often out of proportion to the offense, and the revolt of the prisoners often leads to tragic incidents. Such was the case when the prisoners of the St. Petersburg Transportation prison requested the withdrawal of orders forbidding visits of friends, etc. Their requests were answered by the arrival of the Seventeenth Battalion of Engineers, who speedily established order by means of the butt ends of their muskets.

August 18, of this year, a similar incident took place in the Moscow Transport prison, Butyrki; the prisoners requested an interview with the Director of the prison, Mr. Stankievitch, in

order to complain to him personally about the unedible food. filth and stifling air in the cells and the unwarranted rigid discipline. The request was not granted. The prisoners then revolted openly. They were quickly subdued by two companies of the Pernov Infantry, who invaded the prison court and corridors and fired several volleys against the cell windows, killing two prisoners and wounding fifteen.

The mismanagement of the Russian prisons may be judged from an incident that occurred in the hospital wing of the Butyrki prison, March 22, of this year: an explosion of a lamp was followed by a fire in the hospital ward, rapidly enveloping the entire room in flames. The only exit from the barracks was cut off, and the 28 prisoners, most of them chained at their feet, found themselves in the midst of the flames in this room with its iron-barred windows. When the firemen arrived, the majority of the prisoners were unconscious and covered with severe burns. Four of the prisoners died of the burns received.

It is not to be wondered at that the Russian prisons are sources and breeding places of various neuroses and infectious diseases. Indeed, according to a recent report of the Governor of Moscow, the hospital ward of the prison contained 20 insane prisoners, 14 cases of scorbutis and 11 cases of various infectious diseases (febris recurrences, erysipelas, measles, etc.). Typhus fever is particularly prevalent in the transportation prison Butyrki, and causes a high mortality among the prisoners. In the beginning of this year, when Mr. Durnovo imprisoned 72,000 persons in order to save the remnant of the Russian State rights, as he delicately expressed himself, typhus fever broke out in the Butyrki prison, causing a marked mortality among the prisoners. The superintendent of the Zemstvo Hospital for the Insane, at Mesezezeresk, Dr. Lebedev, was one of those victims. He had been arrested on suspicion of political unreliability! Wishing to have him receive decent medical attendance while he was stricken with the disease, his friends asked the authorities' permission to have him removed to one of the city hospitals, but the request was promptly refused. The Zemstvo authorities then intervened themselves and finally obtained permission to remove him, when death had spread its shadows over the hopelessly stricken man's features. He was transferred to the Sokolniki Hospital, where he shortly died of the fever.

Nor was the "model institution," Kresty, at St. Petersburg, spared the visitation of typhus fever. In the early part of this year a severe epidemic raged among the prisoners. The stricken patients were transported to the hospital barracks, and friends

were now readily permitted to visit them! The medical officers energetically protested against this ill-timed administrative liberality; in consequence of this protest the women were no longer allowed to sit on the beds of their stricken husbands, but were led into the morgue, where they could view the corpses of their bread winners.

It need hardly be added that in the other prisons of the vast Russian empire all sorts of epidemics, particularly tuberculosis, are firmly rooted. Many of the prisoners are stricken with melancholia, and insomnia of months' duration is claiming many victims. Robust persons with well developed nervous systems and bodies soon break down under the stress of these conditions in the Russian prisons; and still less do the youths confined in large numbers fail to break down there. Such was the case, indeed, with a 14-year-old school girl, who was confined in the Butyrski prison; her health gave way and she sank into melancholia.

What has been said about the life in the Russian prisons sufficiently explains why the proportion of suicides is so enormously high. I shall confine myself to the description of only three cases of sucide that are typical of the conditions under which we exist. A teacher, P. Mjakotin, 29 years old, exasperated by his condition, cut a sardine box into small pieces and swallowed about 70 bits of the tin. Within a few days after he lay stricken with acute peritonitis caused by perforation of the gastro-intestinal tract. Through the irony of fate, a timely laparotomy saved his life. A youth, Yefimov, was arrested in March, 1905, for some insignificant political offense, and kept imprisoned for eight months. By virtue of the amnesty act, he was set free in November; he was rearrested, however, in December, because he had taken part in a meeting not authorized officially. He was kept in prison until April, when he was at last freed again. Broken down by the sufferings he had gone through, he ended his life by sending a bullet through his brain. A workingman, Sadovnizi, undermined by life in the Kharkov prison, ended his life by cutting his throat, leaving a helpless widow and seven children.

Such is the hygienic status in the Russian prisons.

Meningo-Encephalitic Idiocy.—Drs. Riviart and Chardon: the child was 8 years old, born of an alcoholic father, and first had convulsive attacks when 5 years old. At that age the patient was distinctly idiotic, walked with difficulty, was filthy, could not speak or understand what was said to him, but did not pre-

sent any stigmata of degeneracy. During three years of his sojourn in the asylum the child's condition remained stationary; he was oblivious of his surroundings, did not recognize anybody, but often had spells of anger, bit the children who happened to be near him and knocked his head against the wall. He finally died of miliary tuberculosis. Autopsy: adhesion of the dura mater; edema, congestion and opacity of the pia mater, showing some scattered tubercular granulations. There were extensive interfrontal adhesions, particularly marked and numerous adhesions in the region of the Sylvian fissure; the brain presented a large number of irregularly distributed erosions. All these lesions resembled those found in general paralysis with the exception that there was no atrophy. The lateral ventricles were normal. Numerous tubercular granulations were found in all the organs. The case was one of meningo-encephalitic idiocy (*Gazette des Hopitaux de Toulouse,* Nov. 25, 1905).

A Case of Acromegaly.—Dr. Heilporn: the patient first noticed his trouble about three years ago, following heavy excesses in alcoholic drinks. His heredity is negative, but he has syphilitic ulcerations and diabetes with accompanying polyuria, glycosuria, etc. An X-ray examination shows enlargement in all its diameters of the sella turcica, having a double contour probably due to calcification of the periphery of the pituitary body. The frontal sinuses are of enormous dimensions. There is osteoporosis of the bones of the forearms, the articular spaces are considerably enlarged, there are exostoses on the fingers and deformities of the elbows and knee joints (*Journal de Neurologie,* Nov. 5, 1905).

A Case of Attack by Habit.—Dr. Crocq: a girl, 12 years of age, was in a habit of having an epileptiform attack every week, on Friday night. The author considered the trouble as being of hysterical nature, and gave the patient a hypodermic injection of artificial serum. The child had had no attacks for two months following the day when the injection was made. The remedy acted as an indirect suggestion (*Journal de Neurologie,* Oct., 1905).

Forms of Dementia Precox.— Drs. E. Marandon de Montyel and L. Mongeri: Dr. Mongeri criticises Dr. Marandon de Montyel's views on dementia precox. Dr. Marandon de Montyel looks on dementia precox as on a variety of the psychoses of the degenerate, saying that dementia precox is neither a dementia nor precocious. He adduces reasons in support of this declaration. Dr. Mongeri believes that dementia precox is a psychiatric

entity, and he presents a lively cricicism in support of Kraepelin's dementia precox (*Annales Médico-Psychologiques,* No. 2, 1905).

The Paris Population.—Dr. Lowenthal: the number of marriages is small in Paris, there being only 71.2 married men to each 1,000 unmarried ones (single, widowed and divorced), as against 85 per 1,000 in Berlin; among women there are 43.4 married against 48.5 in Berlin. Tardy marriages, and consequently childless, are more numerous in Paris—46.5 women over 50 years of age, against 26.4 of similar age in Berlin. The death rate from typhoid fever, smallpox, puerperal fever and tuberculosis is much higher in Paris than in Berlin. The average death rate for the period 1898-1902 per 10,000 inhabitants in Paris and Berlin respectively is as follows: the mortality from typhoid fever was 475 per cent. less in Berlin than in Paris; the mortality from smallpox, 15.550 per cent. less in Berlin than in Paris; the mortality from puerperal fever—about equal in both cities; mortality from tuberculosis—90 per cent. less in Paris than in Berlin. Nevertheless the latter mortality is high in Paris, and the non-enforcement of the law of public sanitation is responsible for this high mortality (*Progrès Médical,* Nov. 25, 1905).

Criminality in England.—The Annual Report of the Commissioners of Prisons shows the following results: the number of serious or indictable crimes per 100,000 inhabitants has fallen from 37 in 1880-1 to 25.9 for the year under report. Summary offenses, on the contrary, have increased from 542.8 to 560.3 per 100,000 inhabitants. The number of commitments per 100,000 population for the last quarter of a century varied from the highest (621.6) in 1882-3, to the lowest (460.7) in 1900-1. Since 1900-1 there has been a progressive rise, culminating in 586.2 for the year 1904, the number being the highest since 1884-5. The rise, however, has been almost entirely in offenses tried summarily: drunkenness, 1,951; begging, sleeping out and misbehavior by paupers, 3,669; offenses against police regulations, 1,605, that include sleeping out and begging.

Decreasing Number of Medical Students Here and in Europe.—According to the *Gazette des Hopitaux de Toulouse,* Nov. 25, 1905, the United States is not the only country in which the number of medical students is markedly decreased at present; Germany and France have experienced similar decreases. In the United States, in 1904, there were 28,142 medical students, whereas this year, 1905, there are only 26,137 students. The homeopathic schools have suffered the most marked losses: in

1900, there were 1,509 students as against 1,104 in 1905. In Germany the total number of students progressively increased from 2,054 to 8,513 during the period 1858-1888. This number rapidly decreased and in 1903, there were only 6,232 students. In 1895, the number of medical students in France was 7,779, while in 1905 there were only 6,763.

The Effect of the Bearing of Young Upon the Body Weight and the Weight of the Central Nervous System of the Female White Rat.—JOHN B. WATSON: the effect of the bearing of young is to render the mated rats slightly heavier than the unmated, some of the excessive weight being due to the large amount of fat present in the mated animals. The proportional brain weight is not appreciably affected, but the spinal cord is distinctly heavier in the mated series, thus making the central nervous system as a whole heavier. The percentage of water in both the brain and spinal cord is in nine cases out of ten greater in the mated groups. This is perhaps the most important difference established by the investigation, but the interpretation must await a further study of the diminution of the percentage of water in the central nervous system with advancing age and the conditions that probably modify it (*The Journal of Comparative Neurology and Psychology,* Nov., 1905).

Eschars in General Paralysis.—DR. A. VIGOUROUX: some eschars are due to prolonged pressure or neglected nursing; there are other eschars, however, due to central and peripheral lesions of the nervous system—myelites and neurites, accompanied by epileptiform and apoplectiform attacks, that can only be alleviated, but not prevented by nursing. From a medico-legal point of view the fact is of importance: physicians and attendants should not be accused of negligence when eschars due to organic lesions of the nervous system afflict a general paralytic (*Revue de Psychiatrie,* Oct., 1905).

Speech Training as a Factor in the Development of the Feeble Mind.—DR. G. HUDSON-MAKUEN: defective speech of the feeble minded constitutes an important hindrance in obtaining an education; the difficulty in expressing their thoughts leads the feeble minded to laziness in thought and consequent mental degradation. Speech and thought go hand in hand, as, according to Max Muller, "to think is to speak low, and to speak is to think aloud." The training of speech should occupy an important place in the curriculum of schools for the feeble minded (*American Medicine,* Dec. 2, 1905).

Infanticide. Anatomical and Clinical Contribution.—Dr. G. Mondio: fifty-six cases of infanticide are studied and the brains of six of the subjects are presented. According to the author, anomalies of cerebral morphology existed in the six cases. Cranial anomalies existed in many of the 56 cases recorded (*Il Manicomio,* No. 1, 1905).

Two Years of Family Patronage of the Insane, Department of Kherson.—Dr. Jakovenko: the cost has been 47.2 kopeks per capita per day, as against 92.5 kopeks in the central hospital, 75.8 kopeks in the farming colony and 52.3 kopeks in the chronic wards (*Journal Nevropatologii i Psichiatrii Imeni Korsakova,* No. 2, 1905).

Why Do Certain Deaf-and-Dumb Subjects Hear Low Pitched Notes Better than High Pitched Ones?—M. Marage: This peculiar inversion of hearing is due to a tactile, not an auditory mechanism. Experiments on worms lead the author to the above conclusion (*Progrès Médical,* Nov. 25, 1905).

Cerebral Hereditary Syphilis.—Dr. William J. Butler: two cases of children, 23 months and 6 years old respectively, are cited, typically illustrating the disease (*American Medicine,* Dec. 9, 1905).

Lombroso's Jubilee.—Professor Lombroso's Jubilee was celebrated last Spring in Turin, Italy, in joint session with the VIth International Congress of Criminal Anthropology. A series of works were presented by leading psychiatrists pointing out the progress wrought by the Lombroso school of criminology.

BOOK REVIEWS.

La Question Sexuelle Exposée aux Adultes Cultives.—Prof. Auguste Forel. G. Steinheil, Paris, publisher. The sexual question is considered from the scientific, ethnologic, pathologic and social points of view. Sexual function and love of man, like that of all other living beings, exists for the purpose of continuing the human species. Hence this question should be treated of from the standpoint of natural sciences, physiology, psychology and sociology. Happiness of man requires that human reproduction be accompanied by progress in the development of the mental and physical faculties, from the standpoint of health, sentiments, intelligence, will power, creative imagination, love of useful occu-

pation and sentiment of social solidarity. Therefore, every attempt made at solving the sexual question should be directed toward furthering the happiness of our descendants. The work treats of the natural history, physiology and psychology of sexual life, its pathology and its social rôle. Although scientific, this chapter is presented in a popular form—for cultured adults, as the author has it, but which could readily be understood by the average American youth. The chapter on the sexual appetite in man, including the sub-titles on puberty, nocturnal pollutions, masturbation, continence, etc., should be read by every youth. Sexual continence is compatible with good health in man. Far more abnormal than continence are the numerous artificial and precocious sexual excitations that we owe to civilization. Being forced to remain ignorant on the question of sex from the scientific point of view, the youth takes the path of sexual excesses because he is afraid of being ridiculed by his comrades if he did otherwise. The term *flirt* is not equivalent with coquettishness, but is a polymorphous word expressing clearly a sexual desire, although the sexual act is not accomplished. Promiscuousness in sexual relations has really never existed because woman is strongly monogamic and both sexes are jealous; but the customs according to which the priest had the right to connubial relations with the bride on the night of her marriage, or a distinguished guest was privileged to dishonor his host's daughter, have a different origin: they were the remains of the customs of privileged individuality or classes. Among savages celibacy is abhored; among some civilized peoples celibacy was so much scorned that when children died young their spirits were married. The Greeks imposed punishment on bachelors, and the Romans imposed heavy taxes on them. Our civilization is responsible for increased and increasing celibacy, economic conditions being the major cause of the evil. The cult of virginity was the outcome of an erroneous notion that there was something shameful in the sexual act. (Vestals, in Rome; Buddha's mother, who conceived her offspring in a supernatural manner, was declared to be a saint and immaculate, and other similar legends among other nations.) Kindness and consideration toward the wife is the product of civilization; in China it is fashionable to beat one's wife; and if one treats her with consideration it is for the purpose of avoiding the necessity of purchasing another. The Arab understands under the term love simply sexual appetite; the ancient Greeks had a similar notion. Among birds the duration of marriage is for life, among mammalia seldom more than one year, but monkeys and man make exception to this rule. The chapter on

pathology of sex is instructive, and should particularly prove of benefit to our jurists. Speaking of sodomy, the author remarks that an examination of some of the cases of sodomy, in which the culprits had been condemned to imprisonment for years, leads him to affirm that the true culprit was not the poor prisoner, but the judge who had committed him to prison: abnormal relations of man with a cow, for instance, has no consequences for the cow, and does not expose the culprit to syphilis. He relates a case of a Mohammedan, who had been sentenced to imprisonment for such a deed on a goat that belonged to him; the Mohammedan accepted the inevitable, but said that he could not understand the logic of such justice. "Nor do I," the author adds.

The question of prostitution is one of struggle for existence in the majority of women. Anent marriage of convenience, the author says that formerly one bought his wife and sold his daughter, while today one sells himself to his wife and buys a son-in-law. Religion and sexual life is an interesting chapter soundly presented. Another practical and useful chapter is that dealing with sexual education in schools for youths.

The volume contains 604 pages in large octavo, and is most instructive—not only for cultured adults, but for all who can understand it. Indeed the author deserves to be highly complimented on this work: his long experience as a psychiatrist and social reformer has particularly fitted him for the difficult task he has taken upon himself in presenting this complex and complicated subject. He is thoroughly familiar with the physical life of man and knows that many a family is ruined today because of man's natural polygamic tendency, or rather because his aversion to monotony in conjugal relations forces him into polygamy. The author proposes, therefore, a reform that would radically change this condition, namely,—free marriages or legal polygamy; also legal polyandry for those women whose natures require polyandry. Whatever merit or demerit attaches to this proposition every reader will judge for himself. It is only fair to remark, however, that the main bulk of the question is masterfully handled in this volume, although some details are at variance with accepted notions of society.

The price of the volume is 10 francs.

Die Simulation von Geisteskrankheit. Mit einem Anhang: Die Geisteskrankheit in den Gefaengnissen. —By PROFESSOR P. PENTA. Translated by Dr. Rudolf Ganter. Published by A. Stuber, Wurzburg. Price 4 marks 50. The author has studied

simulation of mental diseases especially among prisoners in Naples. Most frequently those subjects simulate dementia with stupor, refusing to eat or to speak. Maniacal conditions are also simulated; some subjects present alternating melancholia with mutism and maniacal excitation. In some instances the simulated disease lasts for two or more years. The determination to deceive the physician is so marked in some cases of mutism that the application of red hot iron to the flesh of the simulator fails to provoke the slightest protest from him. The author has handled such cases; and others of his cases of mutism with refusal to take nourishment, although recognized as those of simulation, had to be fed artificially for long periods of time: they would have died of starvation had they not been fed artificially. Most of the cases related have been handled by the author, and in almost all the instances the subjects had confessed to having simulated. From his vast experience with simulators of mental diseases the author concludes that simulation is an indication of abnormal mentality and impending insanity. According to his experience, the majority of such simulators become insane some time after the spell of simulation. This peculiar mental attitude, he says, is more or less of a photograph of the mental status in the near future; the subject is abnormal and his simulation is a forerunner of his technical insanity. On the other hand, there are the technical insane who are skilled simulators as well as dissimulators. Insanity in relation to criminality is considered at length. The volume is most instructive not only for prison physicians but for all physicians who handle the insane; it is most important to know how to recognize a simulator of mental affections.

L'Ame et le Système Nerveux. Hygiène et Pathologie.— By Auguste Forel, *ex-Professor of Psychiatry, University of Zurich.* 8-vo, 340 pages, with ten illustrations and 2 colored plates. Price 10 francs. G. Steinheil, Paris, publisher. The soul and the activity of the brain are one and the same thing. Up to the present time no one has demonstrated the truth of the hypothesis of dualism, or the existence of a soul without a brain and *vice versa;* but every observer may demonstrate to himself that there is no such thing as soul without a brain or a brain without a soul. These statements are developed on the basis of psychology and psychiatry, respectively. As the normality of the soul depends on that of the nervous system, the author points out the importance of general and special hygiene of the nervous system. The question of education is a most important one in the matter of maintaining proper hygiene of this system. The arti-

ficiality of our general system of education is pointed out and a more rational one is suggested. The question of public hygiene comprises a more rational treatment of the criminal, insane criminal, insane, degenerate, alcoholists, etc. The author would prohibit the use of alcohol even in private sanitaria; the struggle against popular alcoholism should be kept up vigorously, and colonies for the treatment of nervous invalids should be multiplied. Procreation should be regulated on a rational or scientific basis. This neo-Malthusianism should be established not for the purpose of decreasing the birth rate but for that of increasing the number of useful and normal beings. The public should ameliorate the conditions obtaining in crowded tenements and fight for pure food. Universities should make it obligatory for students, especially those engaged in the study of medicine and law, to familiarize themselves with the principal elementary notions on psychology and the natural evolution of human beings. The study of nature should be given a prominent place in the curriculum of schools for children.

Experimentation sur la Prophylaxie de la Syphilis. Thèse de Paris, 1906.—Dr. Paul Maisonneuve. Inspired by M. Metchnikoff and Roux's experiments on the abortive treatment of freshly inoculated syphilis in monkeys, Dr. Paul Maisonneuve, of Nantes, submitted himself to an inoculation with syphilis and the abortive treatment. He was the first man to submit himself to this experiment. A thorough examination by leading experts on syphilis endorsed his statement that he was free from hereditary or acquired syphilis. He was inoculated with the virus obtained from two different active chancres, each virus being injected into a separate area on each side of the middle line of the penis. One hour after this operation the wounds were thoroughly rubbed during 5 minutes with mercurial ointment (calomel, 10 grams, lanolin, 30 grams). The results were negative as regards the infection. Four monkeys were inoculated with the same virus. Two of these were treated with the same mercurial ointment: one an hour and the other 24 hours after the inoculation. The first remained free from infection, while the second developed typical secondary lesions. The two which had not been treated developed typical syphilitic infection. The author concludes that syphilitic inoculation treated with mercurial ointment within an hour after the accident is not followed by infection. He considers the efficacy of this method of considerable practical value in the prophylaxis of syphilis.

Christianity and Sex Problems.—Hugh Northcote, M. A. Crown octavo, 257 pages. F. A. Davis Company, publishers. Price $2.00. The author is not a physician, not familiar with anatomy and physiology and states himself that he cannot consider the question of sex from a scientific point of view. He believes, however, that "in Christian religion is found the key to the problems of life." His arguments are based mainly on scriptural quotations. With this scope before him the author presents a number of chapters, some of which treat of Sexuality in childhood, sexual perversion, the sexual act, continence, intercourse during pregnancy, "frigidity," nocturnal pollution, etc., etc. Such subjects cannot be presented to the public in a useful form without the author's thorough familiarity with medical matters, including a thorough knowledge of anatomy, physiology and psychiatry. When an author devoid of these qualifications, and armed only with some biblical knowledge, undertakes to treat of these difficult problems, the question suggests itself: of what practical use is such a volume, particularly when eminent psychiatrists and scientists have presented their volumes on the question of sex?

The Subconscious.—By Joseph Jastrow, *Professor of Psychology, University of Wisconsin.* Houghton, Mifflin and Co., publishers. Price $2.50. Part I of the work treats of normal and part II, of abnormal psychology. Both parts present the practical side of the question, and part III of the work is theoretical. The author deserves credit for the clear manner of presentation of this subject. In clear and pleasing English and almost popular terminology he handles his subject with the simplicity of a clinician-psychiatrist. The subconscious is considered in its rôle during the various stages: normal wakefulness, dreams as well as during the various abnormal states of hypnosis and somnambulism. A remarkably fine collection of clinical cases illustrate the chapters in a simple and dignified manner. The consideration of the relation between the conscious and subconscious is of considerable interest and scientific significance. The subconscious is a study of recent date, properly speaking, beginning with the progress in clinical psychiatry. And Professor Jastrow is to be congratulated on the sincerity and scientific manner in which he has handled the subject in this volume.

Contribution à l'etude de la necrophilie. L'affaire Ardisson.—By Drs. Michel Belletrud and M. Edmond Mercier, of the Hospital for the Insane, Pierrefeu (Var.) Published by G. Stein-

heil, Paris. The entire little volume of 123 pages and seven plates is devoted to the study of a case of necrophilia, or the "Affaire Ardisson," as it is known in Muy (Var). The subject considered here is a young man, 33 years old, a grave-digger by occupation, who found it quite natural to defile the female corpses in the cemetery in which he was employed. He generally committed these acts at night and escaped being detected for a number of years; he was finally arrested because the body of one little girl and the head of another were found in his room in a state of advanced putrefaction. Ardisson explained that he had disinterred the body and head, brought them home and performed his vile practices on them for many days. He was adjudged insane and transferred to the Pierrefeu Hospital for the Insane. A detailed study of this remarkable case is presented in this small volume. The book is not for sale.

Gehirn und Rueckenmark. Leitfaden fuer das Studium der Morphologie und der Faserverlaufs. Mit 122 zum Teil farbigen Textabbildungen.—By Dr. Emil Villiger, *Privat-Docent, University of Basel.* Published by Wilhelm Engelmann, Leipzig. The first part of this work treats of the morphology and embryology of the nervous system; the second—of the course of the fibres of the cerebro-spinal system. The entire work contains 187 pages, of which a helpful index takes up ten pages. There are few pages that do not contain one or more illustrations, some of which are colored. Of the newest works on the normal cerebro-spinal system this is certainly one of the best and handiest because it is concise, yet the most difficult details in the study are generously illustrated in a comprehensive manner. Every student interested in the nervous system will find this a helpful volume.

Die Leukocyten als Parasiten der Wirbeltiere. Ein Beitrag zur wissenschaftlichen Weltanschauung nach einem Vortrage auf der 76. Versammlung deutscher Naturforscher und Aerzte in Breslau, September 23, 1904.—By Dr. Johannes Haedicke. Published by Fr. Schaeffer and Co., Landsberg a. W. The leukocytes are considered from various points of view: in relation to biology, hematology, pathology, dyscrasia, leukemia, essential lymphocytitis, septic pyemia, the infectious diseases, the relation to internal secretions and to many other conditions revealed in the present day literature on the subject. It is a monograph of 166 pages in octavo of most interesting reading on the subject of which it treats.

Enigmas of Psychical Research.—By JAMES H. HYSLOP, *formerly Professor at Columbia University.* Published by Herbert T. Turner and Co. 427 pages in small octavo. The work contains chapters on the residues of science, the ancient oracles, crystal vision, crystal gazing and experiments on the same, telepathy, dreams, apparitions, clairvoyance, premonitions, mediumistic phenomena, retrospect and vaticination. As the headings of the chapters suggest, the subject treated of in this work does not lend itself to any scientific consideration. In his plea for the study of the subjects indicated, the author says that he does not impose the absolute belief in premonitions, foresight, etc., but urges a further study of the matter that seems to him to be significant. Many cases of premonition, foresight, etc., are related.

Lectures on Clinical Psychiatry.—By EMIL KRAEPELIN, *Professor of Psychiatry in the University of Munich.* Authorized Translation from the Second German Edition. Revised and edited by THOMAS JOHNSTONE, M.D., Edin., M.R.C.P., Lond. *Member of the Medico-Psychological Association of Great Britain and Ireland.* Second Edition. William Wood and Co., Publishers, New York, 1906. Kraepelin's school is so well known to the psychiatric world that it is hardly necessary to make any comments on the contents of the work. The translation is creditably made by a psychiatrist of high standing, and will be profitably perused by those who prefer to read Kraepelin's works in the English language. The neatness of the edition is characteristic of the work turned out by Wm. Wood & Co.

Affektivitaet, Suggestibilitaet, Paranoia.—By PROFESSOR E. BLEULER, of Zurich. 8-vo, 144 pages. Price 3 marks. Carl Marhold, publisher. The work is divided into three parts: 1, the consideration of the affective sphere, 2—suggestibility and 3—paranoia. The chapter treating of the affective sentiment is most interesting. Throughout the work the author tries to bring out the relation existing between the affective sentiment, suggestibility and mental aberration. Professor Bleuler is to be congratulated on the happy manner in which he handles this difficult subject.

Primer of Psychology and Mental Disease.—By C. B. BURR, M.D. Published by F. A. Davis Co. Psychology, psychiatry and the treatment of mental diseases are touched upon in this compendium.

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SOFTENING OF THE GENU CORPORIS CALLOSI.

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(From the Anatomo-Pathological Laboratory; Director, Prof. G. Mingazzini.)

The symptomatology caused by lesions of the corpus callosum has been studied lately especially in connection with tumors that had caused more or less complete destruction of that region. This symptomatologic study is not yet complete, however: there is a divergence of opinion not only in the interpretation of these symptoms but also as regards the existence of some of them in relation with given lesions of this region. It seems to me that as regards the divergence of opinion on the nosography accompanying lesions of the corpus callosum, one may repeat what Nothnagel said on the variation of the symptomatology accompanying lesions of the corpora quadrigemina: the variation is due to the dire lack of comparative studies of cases with destructive lesions (circumscribed, focal, hemorrhagic or softening).

The case presented here is one of a lesion of the *genu corporis callosi* caused by white softening.

The patient, T. S. R., 55 years of age, married, laundress, was admitted to the Hospital for Insane, at Rome, February 2, 1905. Her early history cannot be had. She contracted syphilis some years ago and had had two abortions. She did not remember the date of these abortions and said that she had not received any treatment for the syphilitic infection.

OBJECTIVE EXAMINATION.—On admission to the hospital: frame and muscles well developed; complexion dark, hair rather thin; paramammary lymphatic glands felt on palpation; tibial ridge knotty; respiration normal, pulse slow and hard; Huchard's symptom: second aortic sound exaggerated; naso-labial fold more marked on the right side when the patient bared her teeth; she could not protrude her tongue completely; motility of the upper and lower limbs normal; no resistance to passive movements; muscular force quite below the normal, tactile, thermic and dolorific sensibility equal on both sides of the body; right knee reflex more marked on the left side; pupils of medium size, regular, reacted slowly to light.

Attention easily distracted: marked impairment of memory both for recent and remote events. Notion of time and place confuse. No delusions. Incoherence of speech. Aimless repetition of the same words and phrases several times in succession. At times—repetition of words or phrases said before her (echolalia). Affective sphere impaired, the patient showing no interest in any members of her family. No desire for anything. Frequent spells of laughing without any provocation.

November 20, 1906.—The patient was suddenly stricken with an apoplectiform attack while sitting in the garden. Her face, neck and ears suddenly reddened in the order mentioned; she made several attempts at vomiting and then fell. Two attendants came to her aid and led her into the ward, where they put her to bed. The patient's left foot dragged on the ground as she was being led by the attendants. According to the attendants, her left upper limb was also paralyzed when she was lifted up from the ground, and when the hold on her arm was withdrawn, it fell, making some oscillatory movements, to the side of the patient's body.

When examined on the following morning the patient was lying on her left side, her head turned to the right; the direction of the eyes seemed to be normal; the face was reddish and the skin of the face was smooth, without any deep lines; the eyes were open and both upper eye lids at the same level; the naso-labial lines were markedly effaced on both sides. The patient opened her mouth with much difficulty and succeeded in protruding her tongue only slightly; the tongue was deviated to one side. Deglutition of liquids was normal but she could not swallow solid food. The left extremities were paralyzed and presented marked resistance to passive movements. The lower right extremity could be moved only slightly and with great difficulty. Voluntary movements of the right upper extremity were also slow and limited,

and it was impossible to lift it above the horizontal line. There was also marked resistance to passive movements. Tactile, dolorific and thermic sensibility normal in so far as could be judged from the motions of reaction to pain. She screamed when pricked with a needle but made no attempt to ward off the stimulus that caused the pain, nor did she carry the right hand to the region pricked.

The knee reflexes were marked on both sides; the tendon Achillis reflex could not be obtained; Babinski's and abdominal reflex were absent. The pupils were unequal (the left one being the larger), rather dilated and did not react to light.

The patient did not speak and it was difficult to know whether she understood what was being said to her. Her face was expressionless and she stared in a fixed manner. She did not partake of any food put before her, but swallowed it when put into her mouth.

Bed sores in the sacral region developed two days after she had been put to bed, although all precautions had been taken to prevent the trouble. In a few days the ulcer extended to the bones, was black and measured about five centimetres in diameter.

A few days later resistance to passive movements was still more accentuated and muscular movement of the right upper extremity was still more limited.

December 6, 1906.—The patient remained in bed on her back, her head turned to the left, the eyes looking with a fixed stare. Expressionless face, no matter what was said to her. The eye muscles seemed to be normal. The lower extremities were flexed at the hip and knee joints and both feet turned outward. Marked resistance to passive movements in the entire body. Pressure on the foot and leg was followed by pallor of the parts that disappeared after a certain time. The left forearm was flexed at a right angle at the elbow, the hand flexed at the wrist and closed in a fist, the whole limb being held close to the body. Passive movement was resisted with great force in this limb. The right upper extremity was held close to the body most of the time and its voluntary movements were limited. At times this limb was flexed at the elbow and wrist, the hand resting on the chest. Resistance to passive movements was less marked in this than in the left limb.

After considerable insistance the patient was made to open her mouth: she remained with her mouth open about a minute. The naso-labial lines were effaced on both sides while the mouth was open; the tongue was tremulous in the buccal cavity. The head resisted to passive movements in the direction of its three axes of rotation. Impossible to make her sit up in bed on account

of resistance to flexion and extension at the various joints. Pricking with a needle and touching her with hot objects made her cry out, but she made no defensive movements, not even with the right upper extremity. The pupils were still unequal and did not react to light. Absence of abdominal and Babinski's reflexes on both sides. Pharyngeal reflex normal. Tendon reflexes of upper limbs exaggerated. Fecal and urinary incontinence. Commencing bed sores at the points of the inner trochanters of the femur and fibulæ. This was preceded by blisters filled with yellowish effusion. The rupture of the blisters was rapidly followed by deep ulceration at first dark red and then black in color. The pulse was rapid and often irregular, respiration superficial and interrupted by irregular pauses. No rise of temperature at any time. This condition continued until death took place, December 13, 1906.

Autopsy.—Autopsy made 24 hours after death. Dura mater normal. Pia mater normal in color and thickness and tore off easily from the cerebral substance. Both frontal convolutions smaller than normal; their configuration and consistency normal. Development and configuration of the rest of the convolutions also normal. Right hemisphere decidedly smaller than the left one, difference between their maximum diameters about 1 centimetre. On pulling asunder the hemispheres, the anterior end of the corpus callosum presented a creamy mass for a stretch of 1½ centimetres. The softening comprised the whole genu corporis callosi and rostrum. The gyrus fornicatus (callosal gyrus-Huxly, première circonvolution limbique-Broca) was of normal form, color and consistency. A transverse cut made in front of the *genu corporis callosi* and *cornu anterior* of the lateral ventricles showed nothing abnormal. Another cut passing through the anterior end of the corpus callosum showed a soft mass of matter instead of the fibres; this mass had a sharp line of demarkation a few millimetres from the inner side of the ventricular ependyma without encroaching on the fibres turning on the *cornu anterior*. In the plane of a cut passing immediately behind the *tuber olfactorium,* through the anterior end of the *corpus striatum,* the softening of the *corpus callosum* did not exist.

The cavity of the *cornu anterior* was well defined on both sides. The volume, shape and consistency of the *nucleus caudatus* and *putamen* and the *colliculus nuclei caudati* were normal.

A cut passing behind the median part of the *commissura anterior* and *crura anteriora fornicis* showed a lesion of old standing (in the uppermost part of the right putamen which encroaches somewhat on nervous tracts of the upper part of the *crus anterior*

capsulæ internæ); the diameter of this lesion was from 4 to 5 millimetres, extending antero-posteriorly from 5 to 6 millimetres. The corpus callosum and the rest of the nervous elements were of normal aspect and consistency.

SUMMARY.—Patient, a woman, 55 years of age. Remote history could not be had. Marked *risus spasticus*. Two years after the onset of this trouble she suddenly fell in an apoplectiform fit. This was followed by aphasia and tetraparalysis (left hemiplegia, paralysis of the lower right and paresis of the upper right extremities). The autopsy showed the existence of an old lesion in the uppermost part of the right putamen and *crus anterior capsula internæ,* and a recent lesion—white softening of the *genu corporis callosi.*

There can be no doubt that the symptom of *risus spasticus* of old standing was correlated with the old lesion; while the motor disturbances following the apoplectiform attack, within the last 23 days of the patient's life, were in relation with the white softening of the *genu corporis callosi.*

After Nothnagel and Bechterew's demonstration of the existence of a mimic centre in the optic thalamus, many observers (Féré, Rummo, Crocq, Brissaud, Mingazzini, Franceschi, Giannuli, Giannelli) published papers on spasmodic laughing and crying. Recently, Giannelli pointed out that it was important to class separately cases with *risus spasticus* only and those of spasmodic crying only: reviewing these "pure" forms, as he terms them, he found that five out of eight cases presented, besides the lesions commonly found in combined spasmodic laughing and crying, a lesion of the *crus anterior capusulæ internæ.*

The data published in one of my recent cases agree with these conclusions. The case was one of a woman of advanced age. After an apoplectiform attack she presented a profound change of countenance: the slightest provocation made her laugh; most usual acts of every day life made her laugh; the various acts of dressing and undressing herself or of eating, etc., made her laugh, the laughing being accompanied at times by loud outbursts of uncontrollable laughter. The autopsy revealed the existence of a single, well-defined lesion in the most anterior and upper part of the right putamen, in the region limited above and the inner side by the putamen itself, involving at the same time the limitrophic nervous centres situated in the *crus anterior capsulæ internæ.*

The case forming the subject of this paper is similar to the one just recorded: the patient had involuntary and frequent laughing spells that took place without any provocation. In this, like in the other case, the autopsy revealed the presence of a small lesion of

old standing in the *crus anterior capsulæ internæ* and in the most anterior and superior part of the putamen.

The seat and extent of this focal lesion of old standing shows that the tracts whose lesion is followed by spasmodic laughing pass through the upper and anterior part of the *crus anterior capsulæ internæ* and the anterior and upper part of the putamen.

The motor paralysis from which the patient suffered during the last twenty days of her life, following a slight apoplectiform attack, was caused, as has already been remarked, by white softening of the *genu corporis callosi.*

In the literature at my disposal I have found recorded only two cases of softening of the corpus callosum: the first one was published many years ago by Kaufmann; the second, in 1902,—by P. Marie and G. Guillain.

Kaufmann's case.—A man, 45 years of age, suffering from pulmonitis, with meningeal symptoms, was brought to the clinic in a moribund condition and died there the night after his admission. According to the patient's history, he was well mentally. Autopsy: tumor of the right lung, myocarditis and nephritis. In the brain: thickening of the pia mater at the convexity, some parts being edematous and others infiltrated with pus. Similar and even more marked condition at the base of the brain. At the point where the *arteria cumunicans anterior* starts from the *arteria corporis callosi dextra* there was an aneurism, the size of a cherry stone, containing a thrombus. Both olfactory tracts were yellow-brownish in color; of a similar color were the surfaces of the following regions in both hemispheres: first and second frontal, median and dorsal sides of the first frontal; on the right side —dorsal side of the second frontal, the *genu corporis callosi*—the only part of the corpus callosum that could be distinguished from the rest—was also of a yellow-brownish color. That part of the convolution of the corpus callosum, on the right, which turns in front of the *genu* was of a hob nail appearance and shrunken; behind it was distinguishable only up to the region where the *fissura calloso-marginalis* takes a horizontal direction: the lower part of this convolution was transformed into a whitish mass. The structure of the corpus callosum was recognizable at a plane passing through the *gyrus centralis anterior.* The *fornix anterior* was not recognizable, while the posterior was in good condition. The *ependyma dorsalis* of the lateral ventricles was destroyed: within the ventricular cavities, that were dilated, there was a gelatinous, white mass. There were cicatricial ridges in the head of the caudate nucleus. In the left hemisphere there was, besides, a part of the convolution of the *præcuneus* that was also of yellow-

brownish color. The convolution of the corpus callosum was completely destroyed; the head of the caudate nucleus was normal on this side; the third ventricle was spacious. The *commissura mollis* was absent. The anterior and posterior commissures were present. The fourth ventricle was dilated and filled with a turbid fluid. The pons Varolii, medulla oblongata and cerebellum were normal.

P. Marie and G. Guillain's case.—A man, 62 years of age; apoplectiform attack; loss of consciousness; right hemiplegia with spasmodic tendency. Right labial commissure somewhat relaxed. No hemi-anesthesia; when pricked on the right side, he becomes agitated, attempts some movements, but never carries the hand of the healthy side to the point pricked. If pricked on the healthy side, he immediately carries his hand to the point pricked. Knee reflexes normal on both sides, the cutaneous plantar reflexes caused extension of the toes in the right and flexion in the left foot. Cremasteric reflex abolished on both sides; pharyngeal reflex normal. No aphasia, but dysartria. Study of articular sensibility and stereognostic perception not possible. The patient stared toward the left side without his head being turned in that direction. Approaching the fingers to the patient's eyes, in the right visual field, did not cause "clignements des paupières," while this sign existed on the left side. Impossible to make the patient put out his tongue; rectal and vesicular sphincters normal. No albumen or sugar in the urine. Heart normal.

February 2, 1902.—The patient gave his name when asked to do so; could not put out his tongue; when his cap was dislodged he put it on properly. Muscular contractions in the right thigh especially of the extensor cruris quadriceps. It seemed that dolorific perceptions that caused the patient agitation were more distinct at the roots than at the ends of the limbs.

April 2, 1902.—Muscular jerks, choreiform movements of the arm, forearm and hand. Spasmodic movements also in the left lower limb, displacing it now and then.

May 2, 1902.—Choreiform movements marked. No paralysis on the left side. No choreiform movements in the right upper limb that was paralyzed. Pulse 136, respiration 45.

Death.—June 2, 1902.

AUTOPSY.—White softening of recent date, the size of a dime, of the *genu corporis callosi;* the focus extended about 1½ centimetres into the substance of the left hemisphere but not into the right one. A section passing immediately above the *genu* showed, on the left: destruction of the head of the caudate nucleus, the focus being of somewhat older date than was the

white softening. In the lower part of the left hemisphere, near the occipital end, there was a focus of softening the size of a hazel nut. The cuneus in the right hemisphere was almost entirely destroyed by softening of some months' duration; the lesion extended into the *lobulus lingualis.* There were also small focuses of porous degeneration in the posterior end of the lenticular nucleus. Nothing abnormal revealed by section through the pons Varolii and medulla oblongata.

Kaufmann's case is of great importance from an anatomo-pathological point of view, as it was the first and only case of softening caused by embolism of the entire corpus callosum; the seat of the aneurism, at the origin of the *arteria communicans anterior,* making the passage of the emboli equally possible into the right or the left *arteria corporis callosi.* Such a case cannot be utilized clinically, however, because it was impossible to study the patient during life, he having been brought to the clinic in a moribund condition and having died the first night after admission there.

P. Marie and Guillain's and my own case are the only ones published, up to date, of softening of the *genu corporis callosum,* that can be utilized for establishing the symptomatology corresponding to the lesion in that region.

The disorders accompanying lesions of the corpus callosum have been studied especially in relation to neoplasms in that body; the diagnostic signs in that relation are pointed out as follows: 1, absence or slightly marked general phenomena, such as headache, epileptiform attacks, choked disk (Bristow, Ramson); 2, association of hemiplegic phenomena slightly marked on one side and paralysis on the other; 3, gradual onset of the hemiplegia greatly resembling in its manifestation that observed in hemorrhages and softening of a cerebral hemisphere; 4. stupor due mostly to somnolence, bad nutrition and aphasia (Bristow); 5, slow and gradual psychic changes, which in acute cases appear as accentuated stupor, while those of slower course are characterized by hallucinations, irritability and maniacal attacks (Ramson); 6, progressive course of the symptoms, the cranial nerves remaining free from pathologic manifestations (Bristow); 7, contractions without pareses; bilateral spasms or else more marked on one side (Ramson); 8, slight impairment of the tendon reflexes (Ramson).

Mingazzini claims that the above mentioned criteria are not constant and are rather accidental (mehr zufaelligen Charakter tragen). In his cases, the double hemiparesis with unimpaired cranial nerves and intact insensibility made the supposition of a

neoplasm at the base of the skull highly improbable, and pointed rather toward the corpus callosum as the seat of the neoplasm; in other words, there was a coincidence here of two signs, positive on the one hand and negative on the other. Duret looks on such conditions as being pathognomonic of tumors of the corpus callosum; Mingazzini looks on these signs as being much more reliable than are those indicated by Bruns, according to whom the absence of symptoms, pointing toward another localization, constitutes the only criterion of a tumor of the corpus callosum.

Schupfer has tried to find out whether it was possible to determine the exact seat of a tumor of the corpus callosum, *i. e.,* in the *genu, corpus* or *splenium.* According to him, a tumor may be localized in the genu: when psychic disturbances set in a long time before the motor troubles, when an isolated branch of the inferior facial nerve, on one or both sides, is early involved (compression of the fibres derived from the operculum), when the head is turned to the paralyzed side and in general when there is contracture of the muscles of the neck (compression of the fibres derived from the motor centres of the frontal lobe), when the pareses of the upper extremities are more marked than those of the lower and when the impairment of gait resembles cerebellar ataxia. When a tumor involves the middle part of the corpus callosum paralysis takes place synchronously in the upper and lower extremities, the trouble becoming progressively complete. When a tumor involves the splenium, paralysis begins in the lower extremities; the regions supplied by the facial nerve remain intact and the symptoms resemble those characterizing tumors of the cerebellum.

In Mingazzini's case (tumor of the genu corporis callosi) only two of the signs indicated by Schupfer existed; Mingazzini concludes that the symptomatologic criteria of tumors of the corpus callosum, and especially of those involving the *genu,* are not firmly based; so much so that to-day no clinician would base his diagnosis on the criteria mentioned above. He adds that an analysis of the published cases of tumors of the corpus callosum shows that the hemiplegias or tetraplegia were due exclusively to compression or destruction of the motor fibres passing through the internal capsule or lenticular nucleus; and when there is dissociation of the paralyses (mono-pareses or pareses of the upper or lower extremities only) the trouble is caused by penetration of the tumor into the centrum ovale, compressing either the cortical brachial or cortical crural fibres only, of one or of both sides.

These conclusions are not in accord with the results of Schaefer and Mott's experiments, according to which stimulation of the

entire surface of the corpus callosum causes movements on both sides of the body; and after section of the corpus callosum, stimulation of one surface caused movements to take place only on the contralateral side to that stimulated; from these facts it was concluded that the movements were due to indirect stimulation of the motor centres transmitted by the fibres of the corpus callosum.

Lo Monaco, on the contrary, obtained no motor reaction from stimulation of the corpus callosum; he further demonstrated that in animals complete longitudinal section of the corpus callosum could be made without there resulting any disturbance. Operating on monkeys, Albutt also found that this operation was harmless and negative as regards motor and sensory function. Koranyi arrives at the same conclusions from his operations on dogs.

Before confronting the above indicated criteria with the symptoms of Marie-Guillain's and my own case it is well to call to mind that in cases of softening of the corpus callosum the symptomatology is established suddenly, not gradually, as is the case in encephalic tumors. Besides, it is well to note that the hemiopia in Marie-Guillain's case * was due to an old lesion of the cuneus and lobulus lingualis in the right hemisphere; this trouble should not be included, therefore, in the symptomatology of lesions of the corpus callosum. As in my case, for instance, the *risus spasticus,* from which the patient had suffered before the onset of the apoplectiform attack, was due to an old lesion of the *crus anterior capsulæ internæ;* and the anisocoria and pupillary rigidity existed before the occurrence of the final apoplectiform attack.

In Marie-Guillain's case hemiplegia with spastic tendencies developed and its extension resembles that observed in cerebral hemorrhages and softening (Bristow criterian): there were partial muscular contractions in the right thigh and choreiform movements in the left extremities; all this may be brought under Ramson's sign indicated by the number 7.

In my case there was left hemiplegia with marked right hemiparesis with a tendency to bilateral spasmodic movements; this fact could be brought under the heading of the criterion given by Bristow, which is also accepted by Ramson: association of not well defined hemiplegic symptoms on one side with paralysis of the other.

(*) The authors found right hemiopia and a lesion of the right hemisphere. There must certainly be a typographic error: if the hemiopia was on the right side, the lesion of the cuneus should have been on the left side, and *vice versà.*

In my case, as well as in Marie-Guillain's, the cranial nerves were intact,—a condition corresponding to that indicated by Bristow for the localization of tumors of the corpus callosum. In Marie-Guillain's case the knee reflexes were normal on both sides, while in mine they were exaggerated; and Ramson observed slight impairment of the reflexes in cases of tumors of the corpus callosum; in Marie-Guillain's case Babinski's reflex was obtained on the right side, while in mine no reaction was obtained by plantar stimulation. Marie-Guillain found absence of the cremasteric reflexes on both sides, normal pharyngeal reflex and deviation of the eyes toward the left side; in my cases the abdominal and tendon Achillis reflexes were wanting and the patient's head was turned to the left, without her eyes being turned in that direction. In both cases the patients could not protrude the tongue. Marie-Guillain's case presented dysartria, while my case did not speak (aphasia?)

The truly pathognomonic sign of the seat of a tumor of the *genu corporis callosi,* indicated by Schupfer, was found in my case only: deviation of the head toward the hemiplegic side and contractures of the muscles of the neck and nape.

In cases of tumors of the corpus callosum with hemiplegia Steinert lays stress on the diagnostic significance of the more pronounced paralysis of the lower extremities—this condition being reversed in usual types of hemiplegia. Marie and Guillain do not make any remarks on this subject, stating simply that the patient could not move the right side of his body. My patient, on the contrary, had left hemiplegia and right hemiparesis, the latter becoming more marked in the lower than in the upper extremity.

It should be borne in mind that in both cases anesthesia of the paralyzed parts was absent: when pricked, the patients became excited and screamed but did not attempt to push away the offending agent and, although they readily moved their hands, did not carry them to the pricked region; yet, when pricked on the non-paralyzed side (Marie-Guillain's case), the patient immediately put his hand on the pricked region, as normal people generally do. This fact points toward an impaired psychic synthesis of the patient.

In my case, *risus spasticus* ceased immediately after the apoplectiform attack in the corpus callosum; the patient's face was expressionless, the facial lines effaced, and she stared vacantly; she did not answer any questions addressed to her, did not eat spontaneously, although she swallowed liquids put into her mouth; in a word, she was in a stuporous condition.

Bristow has pointed out that in tumors of the corpus callosum the stuporous condition of the patient is due to somnolence, impaired nutrition and loss of speech. According to Ramson, the stupor is always more marked in acute cases, while in those of gradual development the psychic disturbances are expressed by hallucinations, irritability and maniacal attacks.

In one of my studies, made in 1897, I considered the effects of encephalic tumors on mental function; I analyzed 588 cases, 323 of which presented mental disturbances. I pointed out that tumors of the corpus callosum were always accompanied by psychic disturbances. My statement was confirmed by Schuster, Knapp and Maggiotto. According to the data I then adduced, psychic disturbances due to encephalic tumors occurred in the following percentages according to the region involved: Corpus callosum, 100%; frontal lobe, 79.3%; temporal lobe, 66.6%; hypophysis and its surrounding tissues, 65.3%; occipital lobe, 60%; in multiple tumors, 59.6%; pineal gland, 53.8%; parietal lobe, 52.1%; basal ganglia, 50%; cerebellum, 35.5%; motor convolutions, 28.8%; cerebral axis, 25.0%.

According to Schuster, when tumors are located in front of the corpus callosum, the patient suffers from psychic debility; and if the tumor is situated posteriorly, delusional ideas develop.

The symptoms found in the two cases of partial softening of the corpus callosum seem to strengthen Schuster's opinion. Marie and Guillain make no mention of stupor in their case, but remark that mental obnubilation of their patient prevented their examination of articular sensibility, etc. My case presented a distinct stuporous condition. These two cases of softening of the *pars anterior corporis callosi* are certainly of greater importance than are those of tumors in the same region. I do not wish, however, to present a differential diagnosis between a destructive lesion limited to the *pars anterior corporis callois* and the posterior part of this body, because I do not know of any cases of destructive lesions (hemorrhage, softening) involving only the posterior part of the corpus callosum.*

(*) Pelnar and Skalika (*Revue Neurologique*, p. 440 1902) found, like in the two cases related above, two other cases in which the lower part of the *splenium corporis callosi* was of a brown color; this discoloration could be followed to the supra-ependymal layer of the inner part of the *cornu posterior*. There were found focal destructions in other parts of the brain. These cases cannot be utilized for the study of the symptomatology of lesions of the splenium. See also Marie, *Revue neurologique*, 1902.

There were also published two cases of hemorrhage of the corpus callosum: Erb (*Virchow's Arch.*, Bd. 96) and Hougberg (*Neurol. Centralb.*, 1894, S. 227). Both cases are quite similar as to the localization of the lesions and the course of the disease; they seem to indicate that integrity

The pathology of the corpus callosum is as yet insufficiently known for the purpose of establishing a positive diagnosis as regards the exact seat of a lesion in that body (in its totality or only in a given part of it). Yet it seems to me that the analysis of the symptoms observed in cases of tumors of this body and the clinical histories of the two cases of partial softening of the corpus callosum related above warrant the following conclusions:

1. Double hemiparesis either of equal intensity or more marked on one side, with spasmodic tendencies, or hemiparesis with symptoms of motor irritability on the other side (partial muscular contractions, choreiform movements, etc.), with unimpaired function of the cranial nerves point with sufficient exactness toward a lesion in the corpus callosum.

2. Absence of anesthesia of the paretic or paralyzed parts and defect of psychic synthesis of artificially provoked dolorific sensations in the paralyzed parts also point to a lesion in the corpus callosum, and may indicate that there is a lesion of the anterior part of the corpus callosum.

ROME, 1907.

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of this part of the brain is not indispensable because motility, coördination, sensibility and speech were normal in both cases. See also Infeld's case: Ein Fall von Balken Blutung, nebst einen Beitrag zur Zufassung hysterischer Erscheinungen (*Wien. Klin. Wochenschrift,* 1902).

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PROGRESSIVE CHRONIC CHOREA. A CLINICAL AND ANATOMO-PATHOLOGICAL STUDY.

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(From the anatomo-pathological laboratory. Director, Prof. Mingazzini.)

Huntingdon was the first to describe the clinical features of progressive chronic chorea which is also termed degenerative or hereditary chorea of Huntingdon. He was the first to group together the salient features of the disease as they were described by physicians of his day and as he had observed them in a large number of cases that had been almost endemic on Long Island (1). His extensive experience with this disease together with his intimate knowledge of it as he had observed it among the members of his own family enabled him to present a complete description of the etiology and symptomatology of the affection. The description presented by him in 1872 attracted universal attention of the medical profession.

Degenerative chorea is essentially a chronic disease of slow and progressive course, hereditary in most cases, setting in almost exclusively during adult life. Subjects of the lower walks of life seem to be more prone to this disease than are the well to do. The disease sets in with well marked choreic movements and with psychic disturbances ranging between simple intellectual enfeeblement and complete dementia.

I make this summary mention of the salient features of the disease simply in order to compare them with those observed in the case that is the object of this paper. The main physical and psychic symptoms of this case corresponded well to the classic features of Huntingdon's chorea; but the history of the case was rather deficient and it was difficult for me to find any hereditary predisposition, which, according to some authors, is one of the most essential traits of the disease.

The patient, A. E., of Terracina, 42 years of age, driver, was admitted to the Hospital for the Insane, at Rome, December, 1900. According to the patient, neither of his parents had suffered from any diseases of importance or had had chorea. His father had been addicted to alcoholic drinks and died of pulmonary hemorrhage at the age of 50 years. His mother died during childbirth. There were no other children in the family. The patient had always enjoyed good health, was addicted to the use of large quantities of wine and to sexual excesses. His disposition was quiet and he managed to attend to his work properly. Married when 21 years of age, and seven children were born during this union. The first born died of pulmonary tuberculosis when 21 years of age; the second child died of meningitis when 14 months old; the third child died of "convulsions" when 32 months old; the fourth and fifth children (twins) died of diphtheria; the sixth child died of "convulsions" at the age of 17 months; the seventh child died during infancy of a disease of childhood.

The patient became afflicted with choreic movements 18 months before his admission to the asylum; these movements were so slight in the beginning that he himself was not aware of them, but his coworkers had directed his attention to them. These movements became more and more accentuated as time passed on; with the gradual accentuation of the choreic movements his mind also began to show signs of impairment. He became more and more irritable and suffered from increasing sexual excitation. These were the two distinctive traits of his disturbance in connection with the choreic movements. He had sexual connections with his wife from three to five times during the 24 hours and had connections with a number of women besides. His general irritability became so marked that at the slightest provocation he committed acts of marked violence; this was especially the case after he had indulged in alcoholic excesses. His outbursts of violence became so marked that it became necessary to commit him to the asylum.

Condition on admission.—Bony frame well developed, general nutrition fair, thoracic and abdominal organs in fair condition; pupillary reaction to light and accommodation good; tendon reflexes of the upper extremities abolished; patellar reflexes considerably impaired; systematic examination of motility impossible because of the marked choreic movements. Head, eyes and neck continually disturbed by choreiform rapid but superficial movements; the shoulders move up and down, as if shrugging, the fingers are continually in motion, the hands assume now a prone, now a supine position. The lower limbs are less involved in these

movements. The right side of the body is more affected by the movements than is the left one. Muscular force impaired.

Psychically the patient did not present any other features than mental debility, especially as regards the affective sphere and that of morality. He readily adapted himself to his surroundings in the asylum, showing a marked liking for playing cards with the other inmates; he always refused to perform useful work allotted to him in the ward. He constantly complained of everything and everybody and always sided with those of the inmates who were most depraved morally. His physical and psychic disturbances became progressively accentuated: in the early part of 1905 the physical disturbances became so marked, especially the impairment of gait, that he could walk only with the utmost difficulty. Toward the end of the year he could no longer hold himself on his feet and remained confined to his bed. The choreic movements then became most marked and generalized, so that his limbs were continually in the act of incoordinate movement, the limbs and various parts of his body now flexing, now extending without any aim, and his speech finally becoming unintelligible. The muscles supplied by the facial and lingual nerves, and the muscles of the neck were also animated by continual incoordinate movements, so that deglutition became difficult and even dangerous; the hands presented athetoid movements. When the patient was excited the violence of these incoordinate movements was at its maximum, but during sleep the movements ceased. The irritability and impulsive acts which were marked features from the very beginning of the disease became progressively more marked with the course of the disease: at the slightest provocation the patient screamed and fought, dealing blows with his fists, scratching with his finger nails or biting those near him. April, 1906, the patient died of marasmus, at the age of 48 years. The choreic movement ceased about eight hours before death took place.

Autopsy.—The autopsy was performed 24 hours after death. Cranial bones considerably thickened especially at the convexity; frontal bones measured 12 millimetres in thickness. Dura mater considerably adherent to the skull cap; pia mater thickened, especially along the inter-hemispheric fissure and in the parts covering the median surface of the hemispheres; anteriorly there was marked adhesion between the two hemispheres; in the rest of the hemispheres the pia mater tore off easily. The convolutions looked wasted and the fissures gaping. The cortical substance was of a red-grayish color. A cut was made to expose the lateral ventricles; this cut showed a pale, edematous surface, pitting

under pressure with the finger. The fornix and the choroid plexus were adherent to the dorsal surface of the optic thalamus in both hemispheres. Both optic thalami seemed to be wasted and softer to touch than normal. The lateral ventricles were dilated, especially in the posterior horns, and filled with a clear serous effusion. Nothing of note in the rest of the cerebral axis.

The lungs were emphysematous and edematous, without showing any traces of tubercles. Heart small, of brown color, with aortic insufficiency; small areas of arterio-sclerosis in the aortic arch. Liver of normal size and its cut surface dark. Spleen small, brown and of normal consistency. Right kidney very small, the cortical part not readily distinguished from the medullary one; renal capsule easily torn off; this kidney contained in its upper extremity a calcified cyst, about ½ centimetre in diameter, extending one centimetre into the kidney substance and involving both the cortical and medullary substances. Left kidney normal.

Pieces of the brain were taken for microscopic examination from the following parts: superior frontal convolution, anterior central and superior temporal convolutions; from the lobules of the calcarine fissure and the gyrus rectus. Some of these pieces were hardened in Muller's fluid, some in alcohol (96 degrees) and some in an aqueous solution of a 10% solution of formol. Some of the pieces hardened in alcohol were, previous to staining them, imbedded in celloidin and some were not. In either case they were stained with methylene blue and Nissl's stain, with thionin, with toluidin and with cresyl-violet. The pieces hardened in formol were stained with Bielschowsky's method for studying the neurofibrils, and with Weigert's or Benda's method for the study of the neuroglia. For the study of the nervous fibres I used the Kulschitzky-Wolters method on the pieces hardened in Muller's fluid. Some of the pieces, taken from the convolutions mentioned, were kept in pyridin and then treated with Donaggio's fourth method (3) for the study of the endocellular network and the long fibrils. The spinal cord and the peripheral nerves were hardened in alcohol (96%) and in Muller's fluid; these pieces were stained either with Nissl's methylene-blue and cresol-violet or with van Gieson's method. Pieces of muscles were hardened in alcohol, imbedded in paraffin and stained with hematoxylin-eosin and with ferric-hematoxylin and picric acid-fuchsin,—according to van Gieson-Weigert.

Microscopic Examination.—Sections of specimens treated with Nissl's method, thionin, etc., under low power (obj. 4, ocular 4, Koriska): diffuse cellular alterations, especially in the motor convolutions, in which there is a marked decrease of the cellular

elements as compared with an increase in number of the nuclei of neurolgia cells. The latter are seen in groups here and there taking up large spaces deprived of nervous cells. The nervous cells are highly colored and most of them are surrounded by numerous nuclei of neurolgia cells. The layers which should contain a large number of the Betz giant cells present only few of these elements and they appear profoundly altered. The blood vessels are numerous.

Examination under higher power (objective 1/12, homogeneous immersion, ocular 4) of a section of the cortex of the motor convolution showed grave alterations of the nervous cells (fig. 1). The small pyramidal cells presented diffuse central and peripheral chromolysis: the cellular protoplasm was reduced to fine granulations which were highly colored; the nucleus was granular, more highly colored than the protoplasm, and contained a well defined nucleolus but situated eccentrically. Some of these cells were in a state of advanced disintegration and presented almost complete destruction and disappearance of the cellular body; in some of these cells the nucleus was filled with granular matter and the nucleolus was distinguished with difficulty. Numerous neuroglia cells were seen around such cells; other nuclei were seen in groups surrounding pigment granules, and in this mass of nuclei could be distinguished here and there nuclei which had escaped from nervous cells still containing their nucleoli. The cellular prolongations could be followed at a long distance and were serpiginous in their course. The medium pyramidal cells seemed less altered, and in many of them Nissl's bodies could be readily distinguished; their nuclei were well defined, discolored, while their nucleoli were highly colored. The cellular prolongations, especially the apical prolongations, were long and tortuous. Similar alterations were seen in the large pyramidal cells, although their prolongations were less extensive and appeared broken off; their nuclei often did not present any well defined contour and were recognizable only through the presence of the nucleoli; the latter were circumscribed by a transparent disk or halo, in which could be distinguished 3 or 4 large highly colored granules. In Betz's giant cells the chromolysis was more central than peripheral; in some of them Nissl's cells could still be seen at the periphery, where they were highly colored; these cells are rich in pigment and are stained yellow-greenish by Nissl's method. The nucleus was generally well defined and highly colored, but in some cells its contours were not well defined; the cellular prolongations were straight and had a long course. The neuroglia nuclei did not present any marked alterations as regards their

form and volume. They were, as usual, either small and highly colored, or larger than usual and slightly stained; or, when still larger, they were colorless and filled with granulations. These cells were more numerous than usual and grouped in large number in some parts, as has been remarked above. This neuroglia proliferation is much more evident in sections of the cerebral cortex treated with Weigert and Benda's methods: the very fine fibres form a cobweb network, run a long, zig-zag course and appear broken here and there. The blood vessels were numerous and presented a marked increase of the endothelial cells; the lumen of the vessels was narrowed and their walls thickened; pigment granulations could be seen in these walls as well as outside of them. A large number of the vessels were filled with blood clots, some of which contained polynuclear leucocytes. I have not found any plasma cells in my sections.

In the other zones of the cerebral cortex I found alterations similar to those described in the central convolutions; the scarcity of the nervous elements as compared with the neuroglia proliferation was not quite as marked, however; the alterations mostly bore marks of acute degeneration: the cells were often swollen, contained an oval or round nucleus, of very large size, only slightly stained, and containing one or more nucleoli; the prolongations ran a more or less long course and were serpiginous in shape (fig. 2).

There were not many alterations in the cerebellum: only rarely some Perkinje cells presented initial stages of chromolysis, the greater number of them being in good condition and showing distinctly Nissl's bodies; the nuclei were almost colorless and the nucleoli well defined; the cellular prolongations were very short. Nothing abnormal in the granular layer (fig. 3). The blood vessels did not present any marked alterations, but most of them were filled with red blood corpuscles among which could sometimes be seen polynuclear leucocytes. In the spinal cord neither the ganglion cells nor the neuroglia cells presented any alterations. The blood vessels here presented the same characteristics as those described in the cerebrum.

The sections prepared for the study of the neurofibrils were examined under high power (objective 1/12, homogeneous immersion, ocular 8, Koriska). The neurofibrils were very fine in the prolongations of the pyramidal cells and could be seen distinctly; the fibrillary network, however, could not be seen distinctly; at its best it could be seen as a finely granular mass with some hint at a perinuclear network formation. The nucleus was round or oval shaped, colorless, with a well defined nucleolus.

FIG. 1.

FIG. 2.

FIG 3

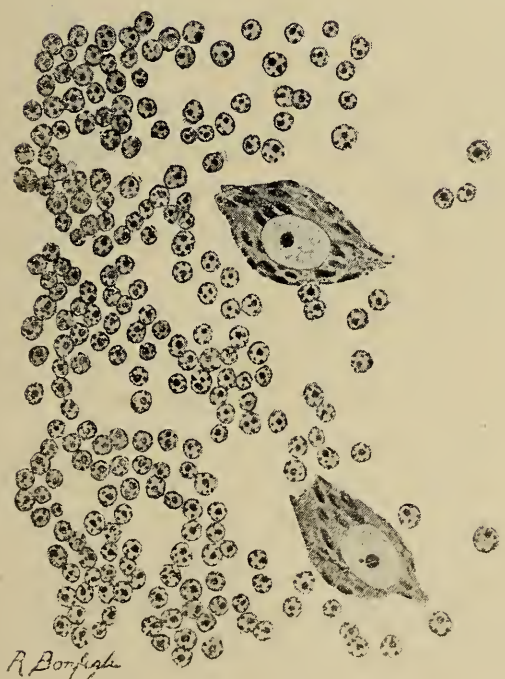
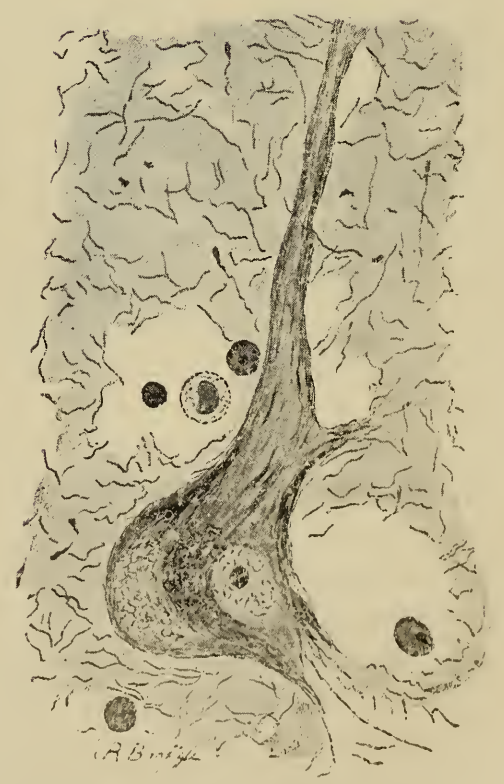


FIG. 4.



There were large masses of pigment, especially in the large pyramidal cells these agglomerations were seen between the neurofibrils and in the body of the cells. The cellular prolongations ran through a long course, and in some rare pyramidal cells could still be distinguished the constituent fibrils of the pericellular network; occasionally it was possible to see within the cell some tracts of fibrils which ran from one prolongation to the other (fig. 4). Outside of the cell the neurofibrils crossed one another in all directions and looked broken on their serpiginous or zig-zag course; they were less numerous around the neuroglia nuclei, and these nuclei were surrounded by large, colorless zones. The breaking up of the fibrils was more marked in the white substance, where the fragments were club shaped or fusiform; around the blood vessels they were more numerous and longer, interlacing in a thick network. In the cerebellum the neurofibrils were in good condition: in the Purkinje cells the pericellular basket work was in good condition and its constituent fibrils could be traced along their entire course. Their connection with the fibrils of the granular layer is always easily demonstrable (4). The fibrils of the endocellular network could also be easily seen and followed from the prolongations to the cellular mass which they traverse following the curve of the nucleus and the walls. The nucleus was colorless or almost so; the nucleolus was highly stained and the granules presented no alterations. In the sections of the cerebral cortex prepared for the study of the nervous fibres, the projection and tangential fibres could be seen to be in good condition, although they were very much decreased in number, and the supra- and infra-radial were almost absent. The peripheral nerves presented slight alterations: the perineurium was slightly thickened, here and there the myelin sheaths were destroyed, and the blood vessels filled with red blood corpuscles. The muscles were normal.

Summary.—I found grave cellular alterations in all the zones of the cerebral cortex; the alterations were particularly marked in the motor zone and consisted of central and peripheral chromolysis and even total cellular destruction; partial destruction of the neurofibrils; marked decrease and even total disappearance of the deep associations fibres; neuroglia proliferation; vascular proliferation; little, if any, changes in the cerebellum; slight peripheral neuritis.

From the clinical history of this case it is evident that the question here is one of chronic progressive chorea or Huntingdon's chorea. The hereditary nature of the disease, which the deficient history of the case has made it impossible for me to bring to

light, although being one of the most important characteristics of the affection, is not necessarily indispensable for the purpose of establishing its clinical form. According to Debuck non-hereditary but progressive chronic chorea is a form of the disease medium between the acute and degenerative type of Huntingdon's chorea (5); this differentiation is not accepted, however, by the majority of authors, and familial choreic heredity of subjects afflicted with degenerative chorea is considered as an etiologic factor that does not always exist (6). Frank Kurt, for instance, published a case of a woman afflicted with progressive chronic chorea, who had no history of hereditary predisposition to the disease (7). Alcoholic abuses and other physical debilities are important factors in the etiology of progressive chronic chorea; and it is possible that in my case these latter two agents were the causes of the disease. As regards the insidious onset of the disease in my case, the choreic movements were so slight at the commencement of the trouble that the patient was not conscious of them and became aware of them only when his attention had been directed to them by his friends; such insidiousness of onset has been pointed out in other cases (8). In my case the disease set in when the patient was 41 years of age; this advanced age is, according to Wollemberg (9), the most favorable period of life for the onset of progressive chronic chorea. The social stratum of society to which the patient belonged—the lower class—is also considered as being favorable for the onset of the disease (10). The choreic movements ceased during sleep; this was the case even when the disease was far advanced in its course; this condition is always found in cases of chorea (11, 12, 13). The choreic movements ceased a few hours before death, as was also the case in the instances published by Modena (14) and Vaschide and Vurpas (15)—cited by Modena; Vaschide and Vurpas explain this fact by a secondary infection of the central nervous system. In my case the disturbances of speech appeared rather late in the course of the disease; this disturbance is generally an early manifestation and is due to the choreic movements of the tongue and of the muscles of the larynx and the chest (16, 17). Exaggeration of the patellar reflexes is generally a constant sign in chronic chorea (18, 19), but in my case these reflexes were rather impaired.

As regards the psychic symptoms in my case, the exact time of their onset is not known; from the history of the disease it appears, however, that these symptoms showed themselves after the onset of the physical trouble; this succession of disturbances is contrary to that pointed out by Westphal (20), who had ob-

served in one of his cases psychic disturbances five years prior to the onset of the physical trouble. The high sexual excitement in my case is worthy of note, as such disturbance is not mentioned in any of the cases in question recorded in literature. This disturbance was the predominant feature of his psychic trouble; besides, this disturbance is often observed in choreic subjects and has justly been considered as being parallel to the impulsive acts of subjects suffering from Basedow's disease (21). The patient's mental status as death was approaching was above that of mental dissolution so frequently observed at such times in cases of degenerative chorea (22); this mental dissolution of other cases has prompted some author to term the disease choreic dementia and even to draw a comparison between this dementia and dementia paralytica; some authors even go so far as to claim that, on account of the dementia, it is sometimes difficult to make a differential diagnosis between these two dementias (23, 24); according to these authors, choreic dementia is essentially hereditary, familial and degenerative, while paralytic dementia is essentially individual and of an infectious nature (25). The alterations of the cerebral cortex found in my case, like those found in the majority of the cases of Huntingdon's chorea (26, 27, 28, 29, 30), present a certain analogy with those found in the cortex of cases of progressive paralysis: in both cases there is marked glia proliferation to the detriment of the nervous cells, which present marked alterations; in both cases there is also vascular proliferation and inflammatory processes in the same; but other elements were also found, and first among these are the plasma cells, which, up to now, have not been found in chorea.

Is glia proliferation in chronic chorea primary or secondary to vascular inflammation? Today this question is being debated, some considering the process as a result of a primary affection of the nervous elements (31, 32) and the glia proliferation as a secondary process—the glia cells being destined to occupy the places of the nervous cells in a state of dissolution (33). Oppenheim and Hoppe, following in Golgi's path, speak of a disseminated miliary encephalitis, cortical and subcortical (especially in the motor zone), which could explain, in part, the pathogenesis of Huntingdon's chorea; they claim that the minute hemorrhagic focuses may produce an irritation, but cannot produce paralytic phenomena, and the psychic symptoms may be explained by the fact that these focuses are found not only in the motor zone but also in other parts of the cerebrum (34).

In my case, as has been remarked above, the psychic disturbances were slight while the somatic symptoms were very grave;

and the microscopic examination showed, indeed, the most marked cellular alterations in the motor zone. The vascular proliferation was very marked and affected all the zones of the cerebral cortex and especially the central convolutions; the neuroglia was everywhere quite abundant, filling the spaces left vacant by the degenerated or destroyed nervous cells; this increase of neuroglia, consecutive, perhaps, to the vascular inflammation, could suffice in itself to explain the secondary degeneration and destruction of the nervous elements. In my opinion, we are not justified, therefore, in accepting without reserve Modena's claim (35) that chronic degenerative chorea is due to "congenital deficiency of some of the nervous elements"; this deficiency may, in all probability be due to the action of microorganisms and toxin, which, like in Sydenham's chorea, are carried into the circulation at a certain period of life. In that case the disease would be hereditary in the same sense that tuberculosis is hereditary: hereditary predisposition to the disease at a given stage of life. Under these conditions the inflammatory process of the vascular system may be considered as primary and its special localization in the motor convolutions may in all probability be explained on a simple mechanical ground, especially so when it is considered that the median cerebral arteries, which supply the central convolutions, lend themselves more than any other cerebral arteries to the transportation of microorganisms and toxins into the regions which they irrigate.

Rome, January, 1907.

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RESUSCITATION OF ELECTROCUTED ANIMALS. CHOICE OF THE ELECTRIC CURRENT AND METHOD USED. APPLICATION TO HUMAN BEINGS. EXPERIMENTAL STUDY OF THE RESPIRATION AND BLOOD PRESSURE DURING ELECTROCUTION AND RESUSCITATION.

A PRELIMINARY COMMUNICATION.*

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In my paper entited "Electrocution, An Experimental Study with an Electric Current of Low Tension," etc., published in the Journal of Mental Pathology, Vol. VII, No. 2, 1905, I presented two tracings of the respiration and blood pressure in a rabbit subjected to a lethal electric current. Since this publication I have made some further studies of the question of resuscitation of electrocuted animals; some details of these studies are embodied in my thesis, presented at the Paris Faculty of Medicine, July, 1906, entitled "Sommeil Electrique (inhibition des mouvements volontaires et de la sensibilité) par des courants électriques de basse tension et à interruptions modérément fréquestes. Epilepsie électrique et électrocution," and are reproduced in this paper.

The mode of resuscitation of electrocuted animals is simple and its application to human beings may reclaim from death many

* Unless otherwise indicated, the current used is the Leduc current. The experiments were made in the laboratories of physics and physiology, in the School of Medicine, Nantes, France. The tracings were obtained with Prof. Rouxeau's cardio-pneumograph. The technique for using the current is described in my papers quoted here.

who fall victims to electric shocks by touching "live wires" carrying ordinary lethal potentials—up to 2,000 volts.

In accidental electrocutions, with moderate lethal currents, the victims are generally subjected to potentials of from 1,500 to 2,000 volts. If the contact is not good at the time of the accident, the victim may escape death, but in a large number of cases death is caused either immediately or a short time after the accident—in spite of the usual restoratives administered by the physician.

I shall endeavor to elucidate in this paper the following points:

1.—The vital importance of understanding the mode of death in electrocution.

2. That timely medical aid administered to the victim—when he is still breathing or a short time after breathing has ceased—may restore him to life.

3.—The importance of treating the sufferer immediately after the accident and of not delaying the attempt at resuscitation until the patient is transported to a hospital.

Electric industries are so universal today and are multiplying so fast daily that accidental electrocutions are becoming more and more prevalent. It is important for physicians, therefore, to know how to meet these accidents.

First I shall consider the mode of death in electrocution, as it has been demonstrated in my previous papers and in my thesis mentioned above. In my previous papers experimental electrocution was practiced on rabbits, and the salient points bearing on the respiration and blood pressure during electrocution are reproduced in part below.

Tracing No. 1 represents the cardio-pneumogram of a rabbit suddenly subjected to a potential of 12 volts, during 20 seconds. At *A* the current was closed and at *B* it was opened. The condition of the cardiac beats and respiration during the action of the current was precarious and the animal would have been killed had the current been sent through its body a few seconds longer. But the timely interruption of this lethal current at *B* caused a spontaneous return of the respiration and cardiac beats. In tracing No. 2 the same experiment is registered, but the current is one of 14 volts; the current is closed at *A* and opened 32 seconds later—at *B*. On opening the circuit, the animal remained lifeless. At *C* rhythmic excitations were made with the same potential, but life could not be restored.

The Mode of Death in Electrocution.—The mode of death is well illustrated in tracing No. 1, although the animal was not electrocuted in that experiment. The tracing shows that the respiration is compromised while the heart beats still continue to

be registered. Had the current been sent through the body of the animal a few seconds longer, death would have taken place and asphyxia with subsequent heart failure would have been the prime cause of it. In a series of my experiments on electrocution, the heart continued to beat after death and even after the chest had been cut open and the heart laid bare in its pericardial sack. In one case the heart continued to beat for over half an hour after the autopsy. Of course, the beats were *à vide,* the left auricle and ventricle being empty of blood.

In order to elucidate this question still further I reproduce another tracing from my thesis, (p. 78). See tracings Nos. 3 and 4.*

Tracing No. 3 represents normal respiration and cardiac beats of a rabbit. Tracing No. 4 represents the respiration and cardiac beats of the same animal while subjected to a current of 12 volts. In tracing No. 4 the illustration is striking as regards the relative impairment of the respiration and cardiac beats under the influence of a current of 12 volts: there is inhibition of the respiration while the cardiac beats continue in good condition. In the paper in which this tracing was originally used by Professors Leduc and Rouxeau, it was shown that respiratory inhibition could be kept up for one minute without compromising the cardiac beats.

Tracings Nos. 3 and 4 illustrate the mode of death in electrocution as registered in my tracings, Nos. 1 and 2; when the current is comparatively mild, as in tracing No. 1,—a potential of 12 volts, it is clearly seen that the first vital function compromised is the respiration,—while the cardiac beats are still being registered. When life seemed to be compromised, the current was interrupted; on opening the circuit, respiration was immediately resumed, the cardiac beats improved and life was restored. In tracing No. 2, on the contrary, respiratory inhibition was kept up too long a time, 32 seconds, and besides, cardiac inhibition was caused almost synchronously.** The breaking of the circuit did not restore the respiration and the animal remained lifeless for 12 seconds thereafter. An attempt was then made to cause artificial respiration by means of rhythmic excitations. In many cases of electrocution and apparent death from lethal electric currents, rhythmic excitations, if applied in good time, restored the animal to life, in a manner that will be shown here, but in this instance the method was of no avail.

Rhythmic Excitations.—How to Produce Them.—In the series of experiments on electrocution the rhythmic excitations

* Tracings lent me by Professors Leduc and Rouxeau.
** The peculiar cardiogram in this tracing needs further study.

were produced by sending through the body of the electrocuted animal, at rhythmic intervals of from 3 to 4 seconds, and during one second, the current of the same patential which had caused the death of the animal (14 volts, period 1/10, and 110 interruptions per second). In the experiment recorded in tracing No. 2 these excitations proved useless. This does not indicate, however, that a potential of 14 volts is necessarily fatal when it is allowed to pass through a rabbit's body during 32 seconds. Indeed, the same dose of electricity was used and during a longer period of time—42 seconds, on another rabbit, yet the animal was brought back to life by rhythmic excitations with the lethal potential. This experiment is registered in tracing No. 5 and is a striking illustration of the mode of resuscitation of electrocuted animals.

The animal was subjected in this experiment to a current of 14 volts (registering 2 milliamperes .75) during 42 seconds. The relative impairment of the respiration and cardiac beats is strikingly well recorded in this tracing No. 5. There is complete respiratory inhibition with a precarious cardiac condition, and apparent death takes place 42 seconds after the commencement of the experiment. The circuit is then opened, at *O*, but the animal remains lifeless. Eight seconds are allowed to elapse and still the animal gives no sign of life. Rhythmic excitations are then begun with the same potential that has caused apparent death. The first seven respirations are artificial and caused by the rhythmic excitations. Although the blood pressure is almost at zero, the cardiac beats are again registered—irregularly, it is true, The rhythmic excitations are then suspended. The respiratory movements then take place spontaneously, become ampler and ampler, and with the improvement of the respiration the blood pressure gains in strength, rising higher and higher toward the normal.

Thus, it is seen in this experiment that the electrocuted animal was brought back to life by rhythmic excitations with the same potential that had caused death. The point of importance is the fact that the excitations were instituted without great delay,—8 seconds after the opening of the circuit; it was only after the 8th rhythmic excitation, at the end of 19 seconds of manipulation (and 61 seconds after the beginning of the electrocution), that the first spontaneous respiratory movement took place and the blood pressure in the carotid artery commenced to rise.

That death was certain to conclude the experiment, if the rhythmic excitations had not been applied, may be seen from the fact that the gradual fall of the blood pressure in the carotid artery, caused by the closure of the circuit, reached down to 4

centimeters of mercury; and the opening of the circuit did not cause any rise of this pressure; on the contrary, the pressure only became lower and lower, as is registered in the tracing, beginning to rise only after 8 artificial respirations had been produced.

It is important to note that the cardiac beats continued to be registered by the manometer when the rhythmic excitations were commenced. But the cardiac beats may continue to be registered while the animal is dying of asphyxia, as is shown in my tracing No. 2.* Hence, in the experiment of May 16, 1906, registered in tracing No. 5, although the cardiac beats continued to be registered by the manometer, the animal would most certainly have succumbed to the lethal current had not the rhythmic excitations been applied on time and respiration brought into play.

The animal, the electrocution of which is registered in tracing No. 5, was electrocuted twice in the same afternoon and both times rescuscitated by rhythmic excitations with the lethal current. And regardless of this fact, and regardless of the fact that one of its carotid arteries had to be permanently ligated (complete severing of the vessel while the canula was being introduced into it) it made a good recovery.

Prompt Application of Rhythmic Excitations.—The essential point in the resuscitation of electrocuted animals is the promptness of application of the rhythmic excitations, or in other words,—restoration of respiration without too long delay—after the accident. If, indeed, the opening of the current does not cause spontaneous respiration to appear and if one waits until the manometer does not register the cardiac systole any more, too much precious time has been lost and there is little chance of the rhythmic excitations causing respiration to reappear: life cannot, therefore, then be restored.

I have experimented with animals under such conditions, one of which is registered in tracing No. 2; others are not reproduced here. In one of these cases the manometer ceased to register the cardiac systole 60 seconds after the opening of the lethal current, and rhythmic excitations instituted at that time were of no avail, whereas in tracing No. 5, showing a timely application of the rhythmic excitations, the animal was brought back to life.

To sum up the succession of inhibition of the vital functions under the influence of lethal currents:—when the voltage is increased to a lethal dose, the animal passes gradually from a period of inhibition of voluntary movements and sensibility to one of respiratory inhibition, which is soon followed by arrest of the cardiac beats.

* The peculiar cardiogram in tracing No. 2 needs further study and elucidation.

CHOICE OF ELECTRIC CURRENT FOR RESUSCITATING ELECTROCUTED ANIMALS.—I do not propose to give any definite conclusions in this paper as to the absolute preference in the choice of the electric current to be used for resuscitation of electrocuted animals, reserving the full consideration of the subject for another paper. I shall limit myself here to the presentation of results obtained with two different electric currents, laying particular stress on their respective effects on the respiratory centres (and the respiratory muscles) and the blood pressure.

In my paper on electrocution above quoted I pointed out that the current of low tension used in these experiments does not cause any marked muscular contractions. The subject of muscular contractions under the influence of two different electric currents—the Leduc current and the common induction current—is further studied in my thesis quoted above. It is graphically demonstrated in my last work that electrocution with the Leduc current is accompanied by only slight muscular tremors, the muscles of the extremities being affected most by the current; the respiratory muscles, on the contrary, seem to be particularly free from its effects, as may be judged from all the tracings presented here showing the respiratory curves before respiratory inhibition takes place. Things are quite different when an induction current is used on the same animal (the apparatus used was an ordinary sliding induction apparatus, and the electrodes were applied as in the experiments with the Leduc current; the coil used was No. 3—of the finest wire of the series, and complete respiratory inhibition was caused when the coil was moved up to 6.5 centimetres of the scale. The primary current was a continuous current of 6 volts). Not only did the induction current cause marked and generalized muscular contractions, but the respiratory muscles seemed to be be the seat of overwhelming tetanic convulsions even when the minimum effective dose of this current was turned on. As soon as the current was sent through its body, the animal was in a condition of visible suffering that was painful to see; with pupils dilated at the maximum, and convulsed in all its muscles the animal struggled to free itself from the torture, its eyes bulging from their sockets more and more as the coil was being slowly moved up the scale; its chest finally became immobilized and death took place while consciousness of its suffering was in full evidence.

During this experiment the trepidation of all the muscles in general and of the respiratory muscles in particular was so intense that the membranes of the recording drum vibrated with force sufficient to cause a perceptible noise that could be heard at a distance.

The trepidation of the respiratory muscles may be judged from tracing No. 6, recording the commencement of this experiment. The muscular trepidation began even before the coil had been moved up to No. 11 of the scale (see tracing No. 6).

The animal was then subjected abruptly to a stronger current (coil moved up rapidly to 6.5. and 5.5. centimeters of the scale). It was seen immediately that the blood pressure rose only slightly at the moment of the closing of the current, only to fall immediately, and gradually reach to zero (see tracing No. 7). At that moment, the manometer having ceased to register cardiac beats, the current that had been coursing through the animal for 83 seconds was opened, but neither the respiratory movements nor the cardiac beats (the beats registered by the manometer) reappeared (after the autopsy of such animals their hearts continue to beat *à vide* for from 20 minutes to over one-half hour).

Tracing No. 7 shows distinctly the status of the blood pressure in connection with the intense muscular tremors due to the induction current: the blood pressure rises much less above the normal than it does in electrocution with the current of low tension and gradually falls below the normal—to reach zero.

I shall not stop to consider here in detail the interesting correlation between the convulsive muscular movement and the low blood pressure as compared with the respiratory movements and blood pressure recorded in tracings Nos. 1, 2 and 5. I only wish to point out the fact that the induction current used here has a detrimental effect on the respiratory centres and causes asphyxia of the animal while it is still apparently conscious of the sufferings caused it by this current. And while this asphyxia is taking place, the normal strength of the cardiac beats and blood pressure is reduced.

Considering the effects of the induction current on the respiration and blood pressure, it seems to me highly improper to use a high voltage of the induction current for the purpose of resuscitating electrocuted animals. The current of low tension used in the experiments indicated seems to me to be of greatest value for resuscitation purposes.

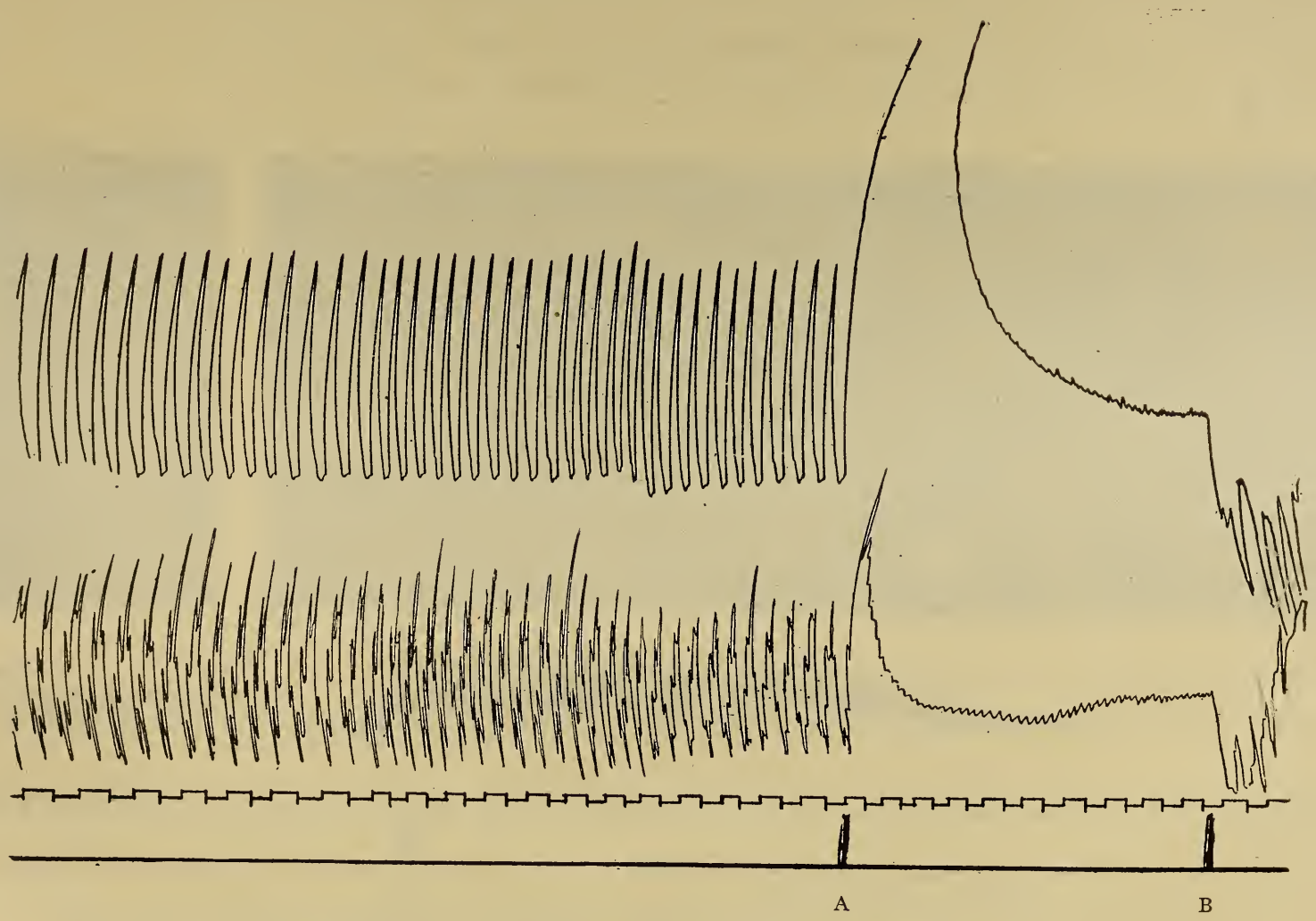
Application in Industrial Life.—In cases of accidental electrocution or shocks with electric current of any low potential up to 2,000 volts, more or less, it seems to me feasible to administer treatment to the victim as follows:

1.—Release the victim from the contact with the current.

2.—Use every means known that will stimulate his respiration —until a physician arrives.

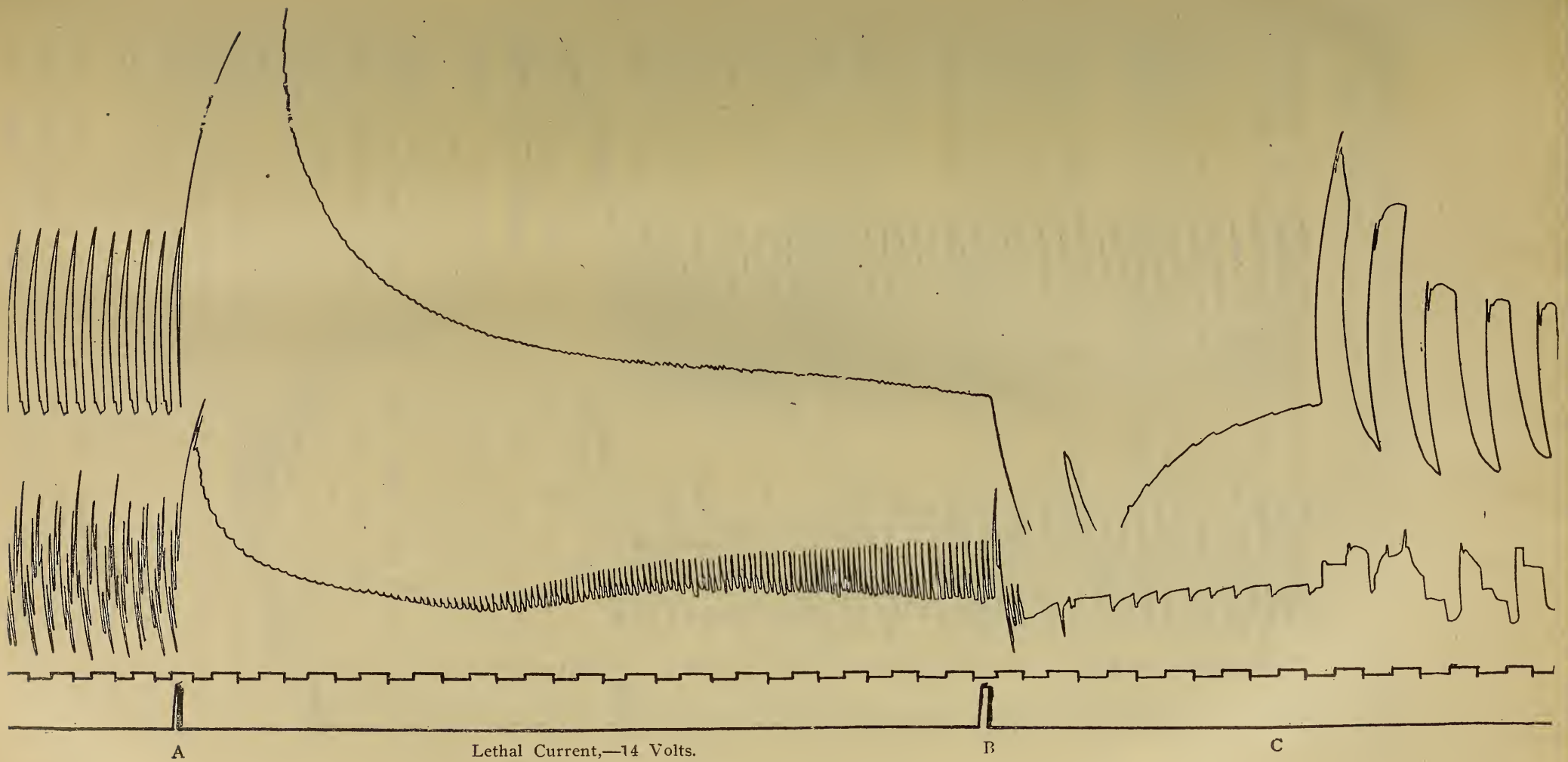
3.—The physician should arrive with the following outfit: an interrupter, such as has been described in my articles mentioned

From the Physiological Laboratory, School of Medicine, Nantes.



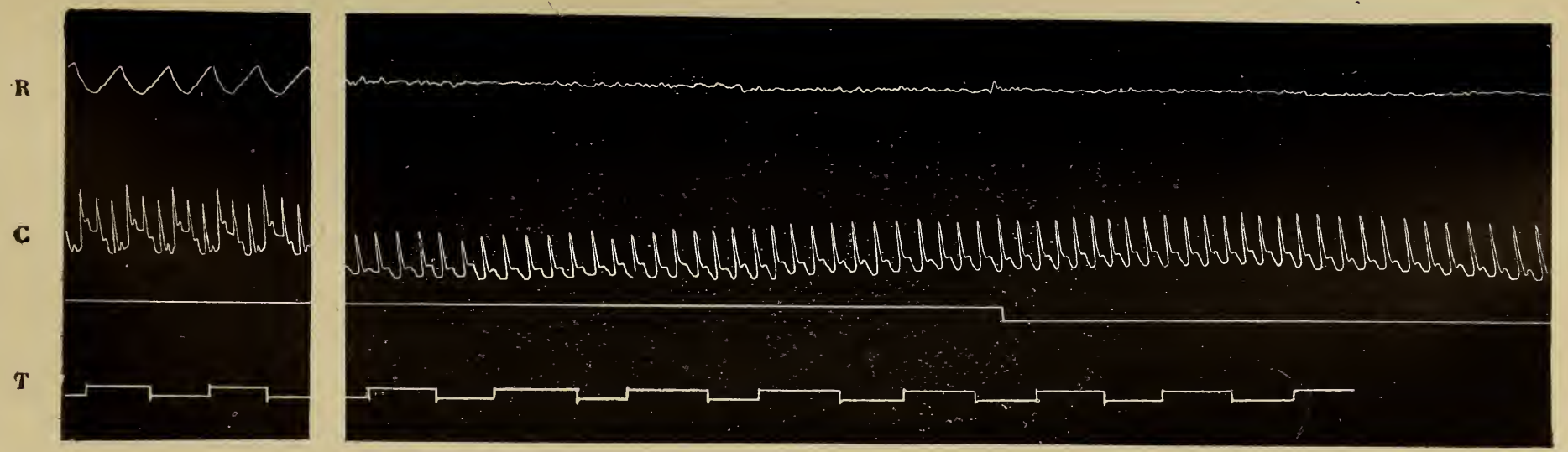
Tracing No. 1.—A, closing of circuit; B, opening of circuit.

From the Physiological Laboratory, School of Medicine, Nantes.



Tracing No. 2.—A, closing of circuit; B, opening of circuit; C, rhythmic excitations after death.

From the Physiological Laboratory, School of Medicine, Nantes.

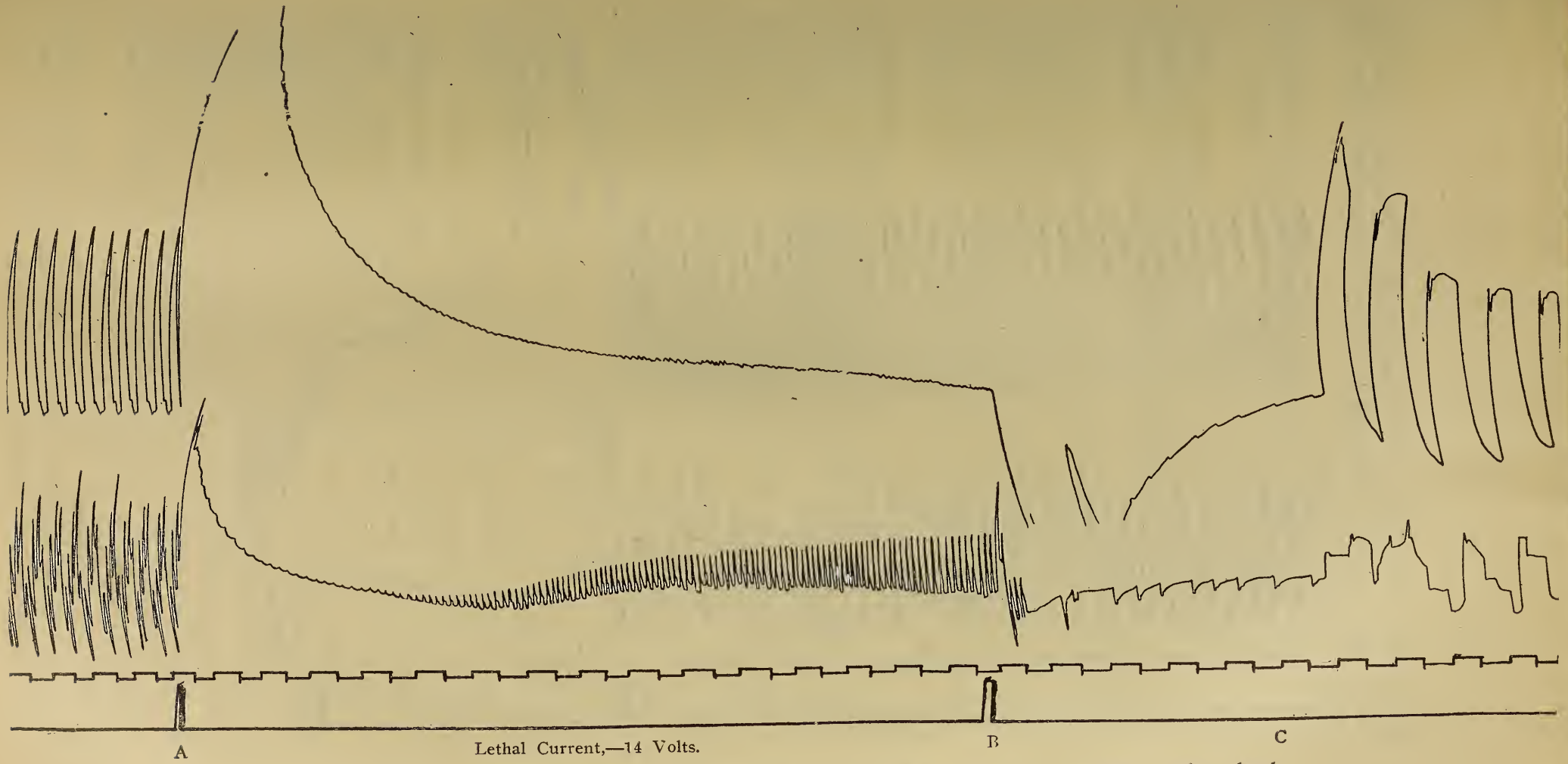


Tracing No. 3.—Normal respiration and cardiac beats.

Tracing No. 4.—Respiratory inhibition, the cardiac beats continuing.

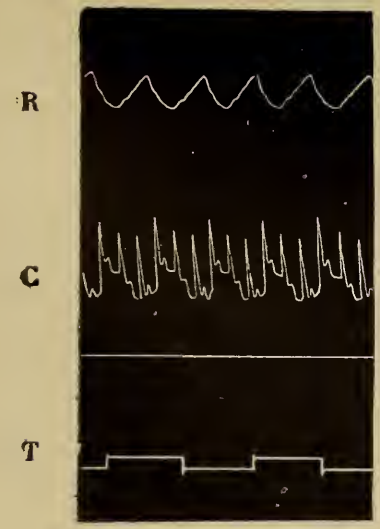
R, respiration; C, cardiac beats; T, time. (1 double oscillation = 2 seconds. Potential, 12 volts.)

From the Physiological Laboratory, School of Medicine, Nantes.

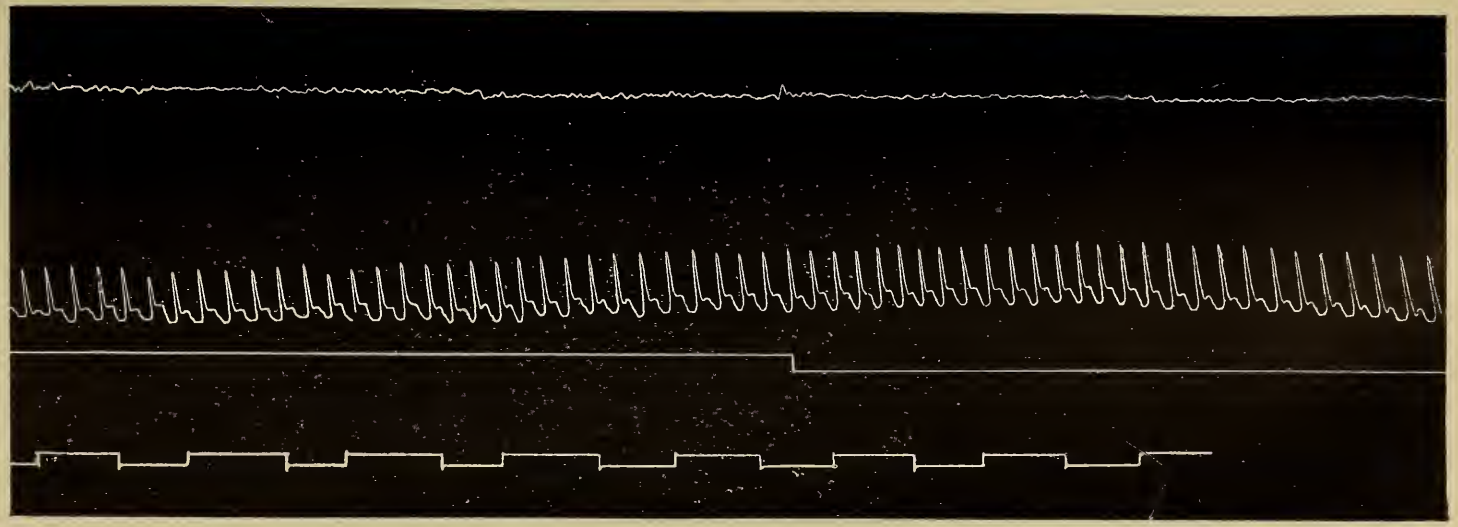


Tracing No. 2.—A, closing of circuit; B, opening of circuit; C, rhythmic excitations after death.

From the Physiological Laboratory, School of Medicine, Nantes.



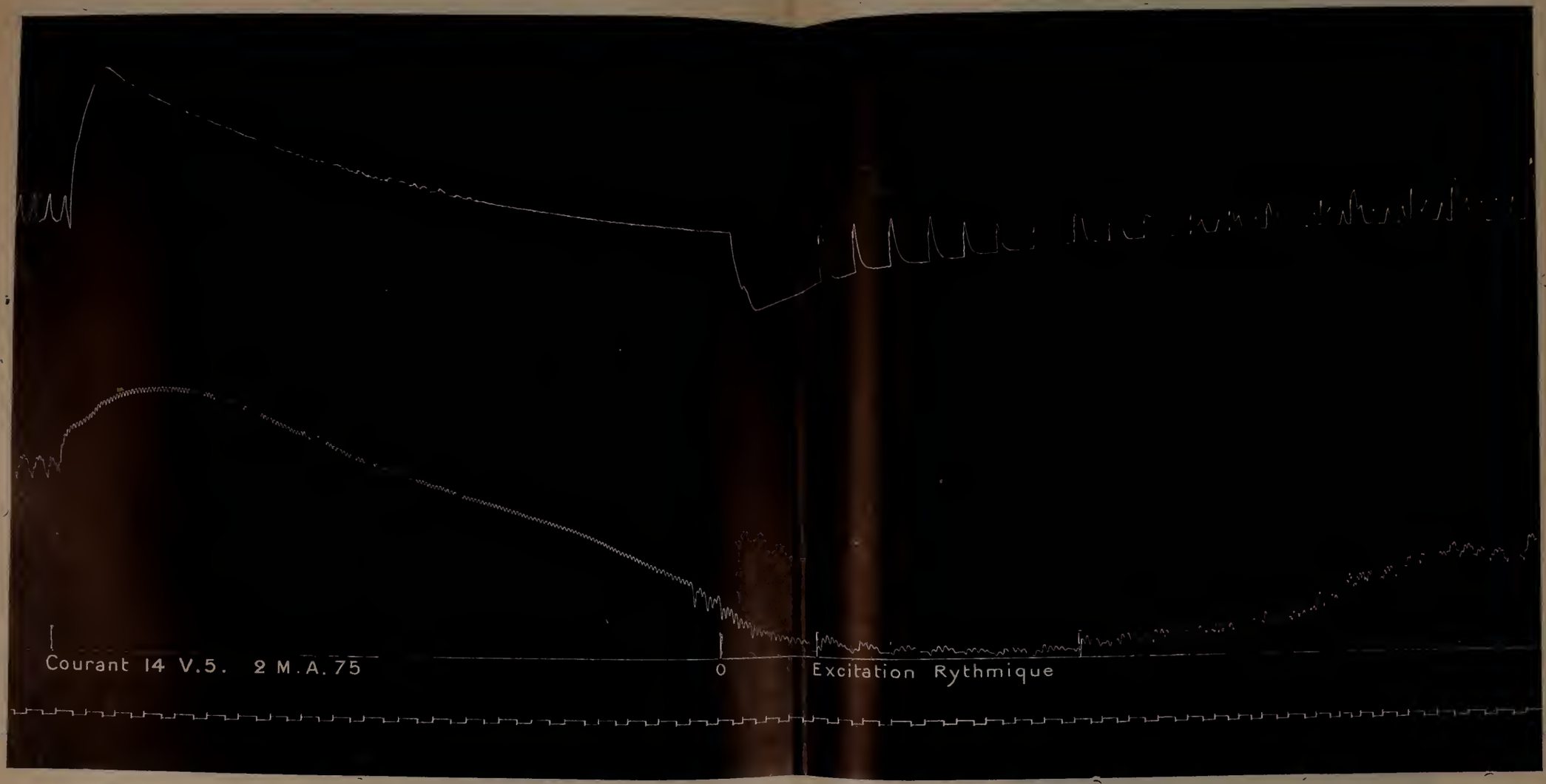
Tracing No. 3.—Normal respiration and cardiac beats.



Tracing No. 4.—Respiratory inhibition, the cardiac beats continuing.

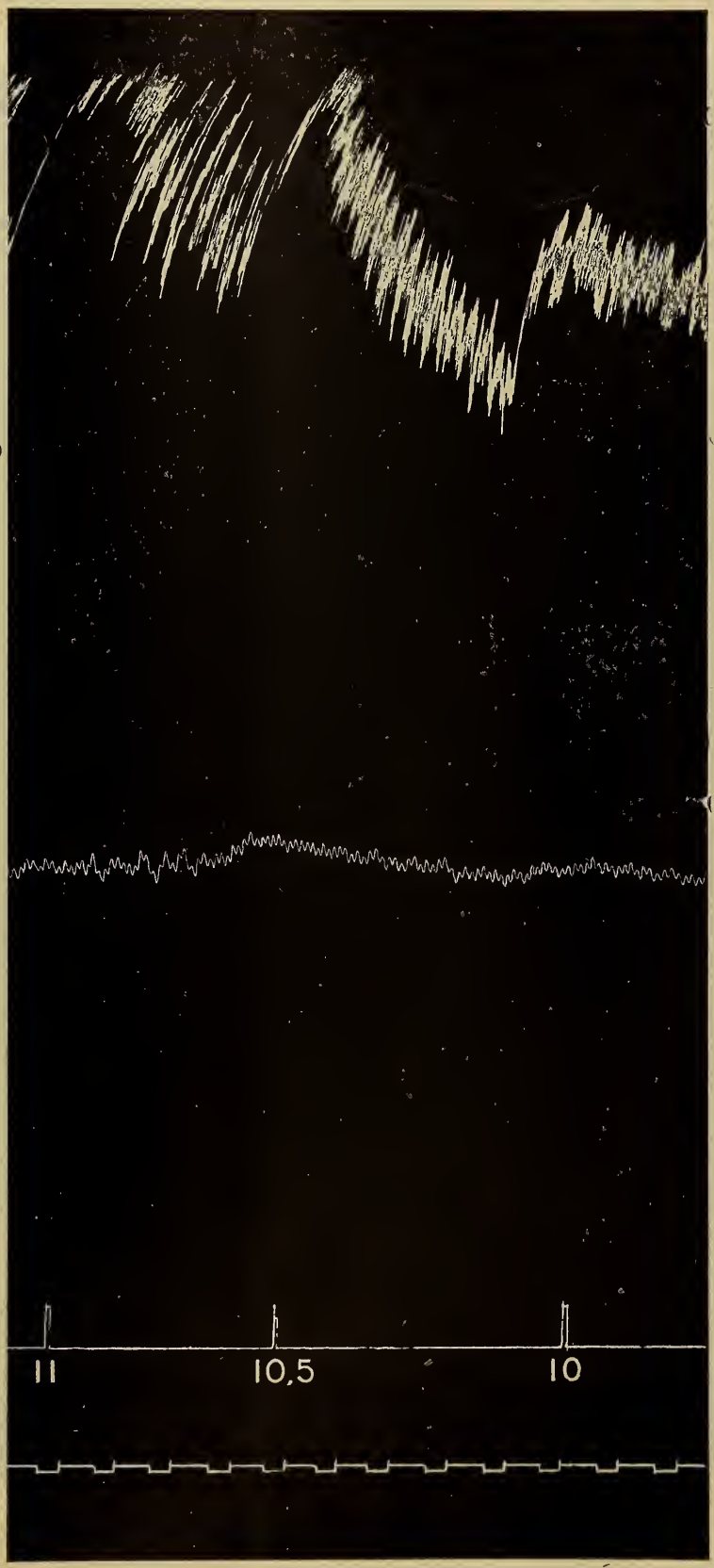
R, respiration; C, cardiac beats; T, time. (1 double oscillation = 2 seconds. Potential, 12 volts.)

From the Physiological Laboratory, School of Medicine, Nantes.



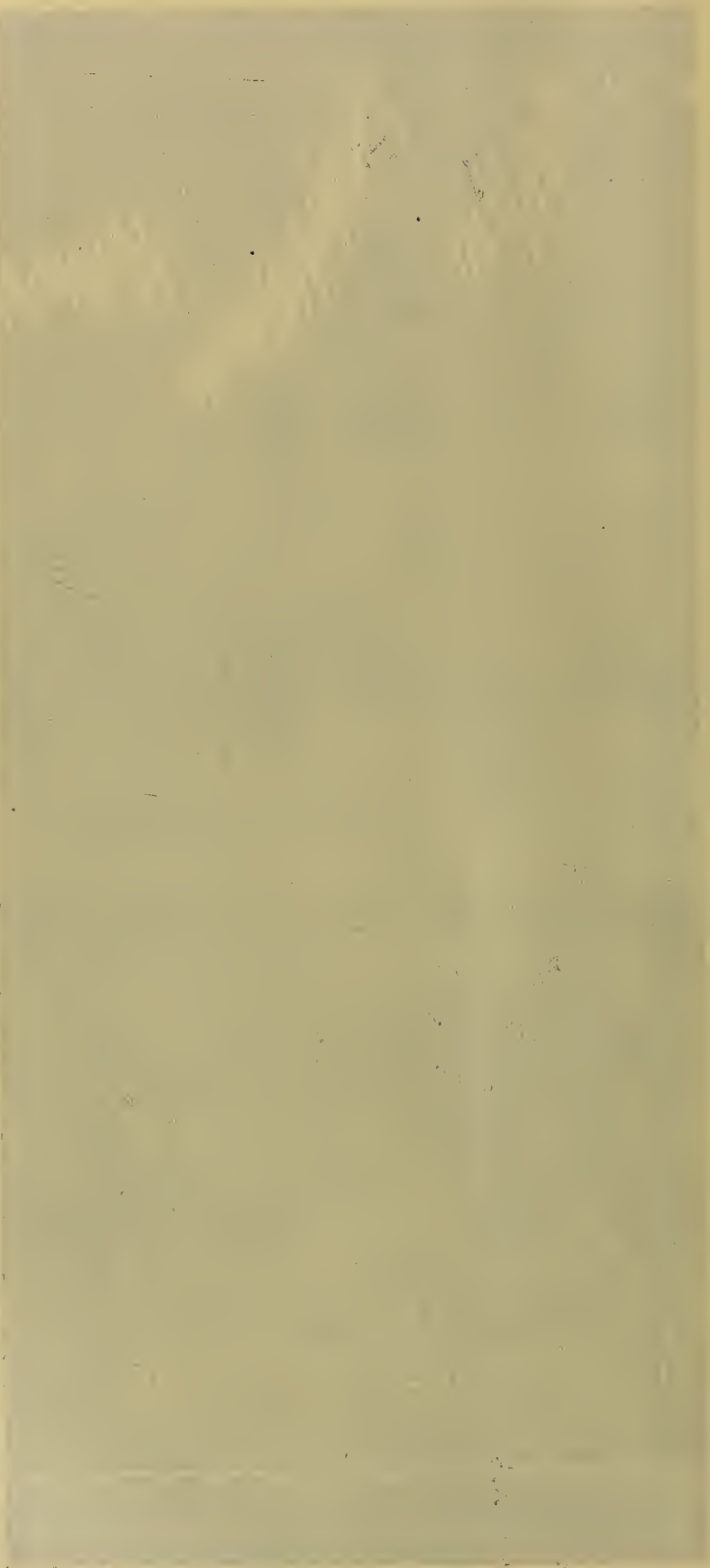
Tracing No. 5.—Rabbit. Electrocution. Resuscitation by rhythmic excitations with the same current that caused the final respiratory pause. Commencing at O, the 3 signals indicate: 1, opening of the circuit; 2, commencement of rhythmic excitations; 3, reappearance of spontaneous respiratory movements.

From the Physiological Laboratory, School of Medicine, Nantes.



Tracing No. 6.—From above downward: 1, respiration (marked muscular trepidation); 2, cardiac beats; 3, position of the coil successively placed at Nos. 11, 10.5 and 10 cts. of the scale.

(*Continued in tracing No. 7.*)



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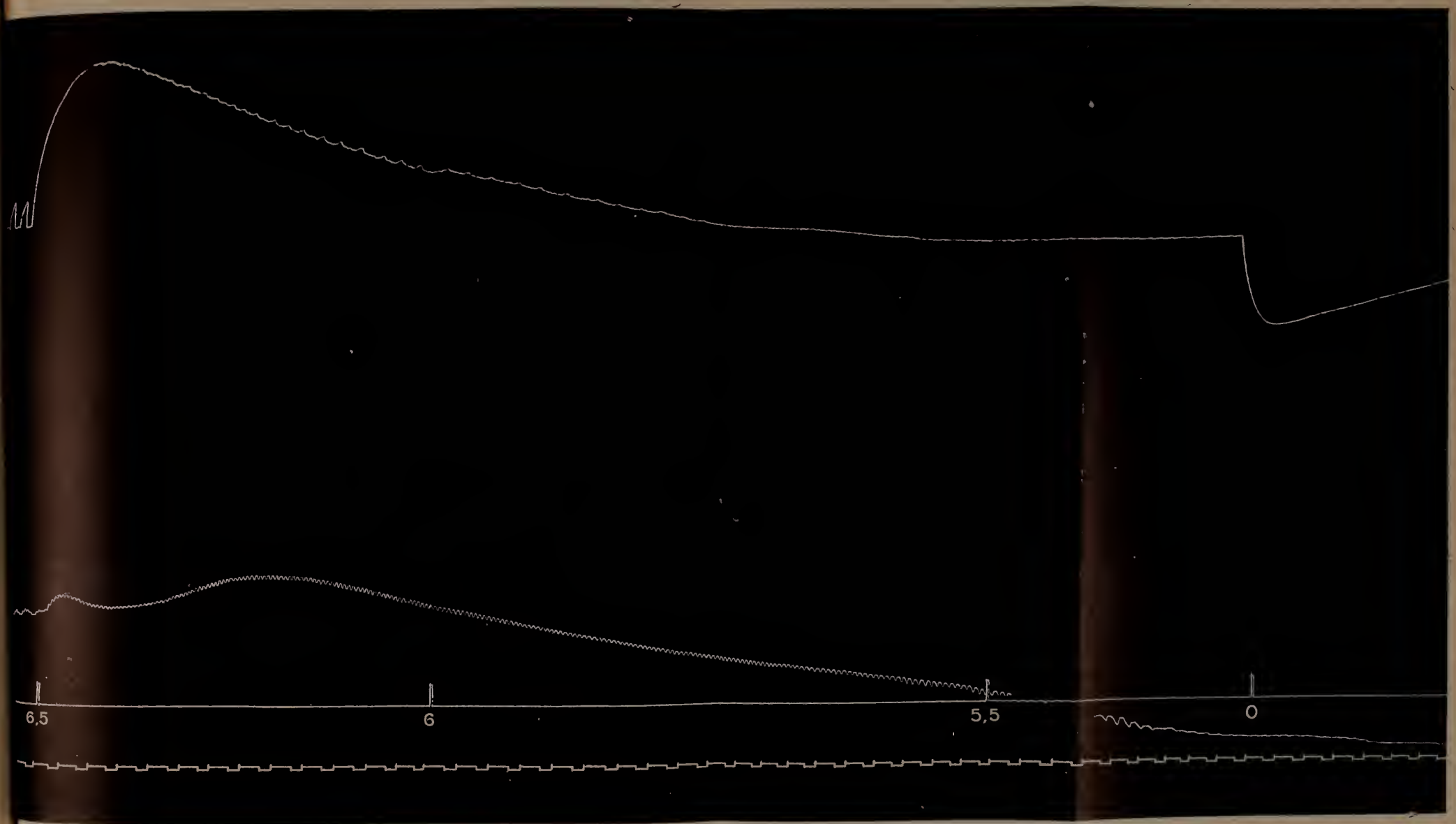

Tracing No. 7.—Rabbit. Electrocution with an induction current. Primary current 6 volts; coil No. 3, placed successively at 6.5, 6 and 5.5 cts. of the scale.

above; if the special interrupter described cannot be had, a simple interrupter with a vibrating rod, constructed on the principle of the electric bell mechanism will answer the purpose (I used with success such a simple interrupter at the International Congress of Psychology, held at Rome, Italy, in 1905); a plug and wire such as are used for a drop light—to connect the reducer of potential and interrupter with an electric source (direct current); any ordinary battery of from 2 to 5 volts to be used as motor power for putting the interrupter into action; a reducer of potential and a small mercury interrupter such as are used in physiological laboratories; two electrodes—one for the forehead and the other for the abdomen; enough wires to make the necessary connections (the technique is fully explained in my papers already mentioned).

4.—The patient should be treated immediately and before he is removed to a hospital.

5.—The patient should be carried into the nearest store or house in which an electric source can be had; the instruments should be put in a series, the electrodes applied to the patient (negative to the forehead and positive to the abdomen) and rhythmic excitations practiced by means of the small mercury interrupter with as little delay as circumstances allow.

To the practiced hand the method is less complicated than it appears to be. The method is particularly applicable in cities where electric light is furnished by a direct current, as in certain parts of New York. The question of using an alternating current is more complicated; but interrupters with transformers can be constructed for the use of either current. It remains for the medical profession to familiarize itself first with this method of resuscitating electrocuted subjects and then to present their wants to the instrument constructors.

The results of my experiments with the induction current as it relates to its effect on the respiratory centres do not warrant the use of this current for the purpose of provoking artificial respiration; but further studies of the subject are needed before revealing any definite opinion as to its merits in this direction.

Some of the cuts reproduced here were embodied in my work published in the French language, and this accounts for the French inscription in one of the tracings.

It is with great pleasure that I once more present my thanks to Professors Leduc, Rouxeau and Dr. H. le Meignen for their kind advice and assistance in this work.

New York, February 28, 1907.

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WHAT PARANOIA IS NOT. A PLEA FOR AN INTELLIGIBLE CLASSIFICATION OF MENTAL DISEASES.

Our esteemed contemporary, the "New York Medical Journal," in its edition of March 9, 1907, publishes editorially an article entitled "The Paranoia Question," explaining that the reason for writing the article is "the absorbing interest taken in the Thaw trial." Whatever this reason may mean, it is unintelligible to us in so far as it relates to the contents of the article, and we shall not attempt to consider it. It is further stated that "fifteen years ago the European institutions were filled with patients thought by able alienists to be suffering from paranoia, while today in many of the same institutions, perhaps even with the same directors, one cannot find a paranoiac without the aid of a magnifying glass." It is further stated that in former times "the admissions of patients with 'paranoia' have been as high as from seventy to eighty per cent."

We regret to say that our contemporary's estimate of the number of admissions of "paranoia" cases in European institutions does not agree with the personal experience of the editor of this publication in some of the leading European institutions. In studies extending over a period of many years in the Ste. Anne

Asylum, Paris, for instance, we found only a very few cases of paranoia; and the reading of hundreds of histories of cases, dating thirty years back, recorded in the handwriting of master psychiatrists, has failed to reveal any overwhelming number of paranoia cases; in fact, only a very few such cases could be found, and certainly the institution was not anywhere near being "filled" with paranoia cases and did not contain "from seventy to eighty per cent." of such cases.

Our esteemed contemporary's attempt at elucidation of "the paranoia question" seems to us to be too "raw" to be considered seriously, as its main source of information on the subject seems to us to have been found in pp. 200-210 of the American edition of Mendel's "Text-book of Psychiatry." And from the knowledge apparently culled from these small 8-vo pages our esteemed contemporary attempts to define what paranoia is,—giving an array of terms such as "paranoid," "mild paranoia," "dementia precox," "phobias," "delusional states following alcoholism, morphinism, cocainism," "persécutés-persécuteurs," "chronic systematized paranoia with recovery," etc., etc.,—all of which does not indicate to us that our esteemed contemporary has any claim to authority in its attempt to throw light on mental diseases in general and on chronic incurable paranoia in particular. But what is more interesting in this matter is the very fact that anything written on paranoia in a German work (American edition) should lead the apparently uninitiated into such a confusion of terms and terminology in mental diseases. Indeed, our esteemed contemporary complains that in English and American sources there "is a lack of definition of what the various writers themselves mean by that term" (paranoia). This last statement is certainly the most intelligible one made by our esteemed contemporary on the "paranoic question," and we cheerfully undertake the task of defining what paranoia is, or rather,—what paranoia is *not*.

Paranoia is not anything in the shape of mental diseases mentioned in the above named article on "the paranoia question."

Paranoia is not "those mild insanities in which various 'phobias,' fixed ideas and obsessions are features, developing on a psychopathic foundation," in which delusions of persecution are very frequently encountered.

For a splendid clinical picture of "phobias," obsessions and impulses, with or without accompanying delusions of persecution, and with or without accompanying alcoholic delirium, we refer to Magnan's "Recherches sur les centres nérveux," or to the articles published in English, in this JOURNAL, Volume I, Nos. 4-5, and entitled "A Clinical Study of Morbid Obsessions and Impulses."

Paranoia is not a disease of "post-infection and post-toxic forms."

Paranoia is not an acute "paranoid" disease.

Paranoia is not dementia precox.

Paranoia is not a "maniac depressive" disease.

Paranoia is not a "toxic secondary paranoia."

Paranoia is not the delirium of the persécutés-persécuteurs.

Paranoia is not a curable disease.

For a clear clinical picture of a persécuté-persécuteur and of paranoia (chronic delusional insanity of systematic evolution) we refer to Magnan's work quoted above as well as to the papers entitled "Suicidal and Homicidal Acts,—their Clinical Aspects and Medico-Legal Significance," published in this Journal, Vol. V, Nos. 1, 2-3 and 4-5. The reading of these papers may also yield definite clinical notions on the various systematized delirium, whether accompanied or not accompanied by obsessions, or impulses, or alcoholic, morphine, cocaine or other intoxications.

Paranoia is essentially an evolutional disease, in the sense so well crystallized by Magnan more than fifteen years ago: it has four distinct stages of evolution: 1,—period of incubation; 2,—period of delusional interpretations; 3,—delusions of grandeur and 4,—period of dementia.

This disease is incurable even when the period of dementia is delayed for many years.

There is no other affection in the scale of mental diseases that has these characteristics.

Paranoia, consequently, is not anything in the shape of those mental diseases with which our esteemed contemporary confounds it.

And as we read our contemporary's appreciation of what paranoia is—in the eyes of various authors—we forcibly call to mind Cuvier's reply to his friends' definitions of a crab:

"A crab,—a small red fish, which walks backward."

"Perfect, gentlemen," said Cuvier, "perfect,—only I will make one small observation in natural history: the crab is *not* a fish, it is *not* red and does *not* walk backward. With these exceptions your definition is admirable."

Similarly, we repeat, that paranoia is *not* "abortive paranoia," nor "phobia," nor "fixed ideas," nor the delirium of the persécuté-persécuteur, nor systematized delusions following alcoholism, morphinism, cocainism or infection, nor "paranoid" insanity, nor dementia precox, nor, we repeat once more, anything in the shape of the mental diseases enumerated in the article presumably intended to elucidate the "paranoia question." With these exceptions, our contemporary's definition of paranoia is admirable.

While a good deal of confusion seems to characterize some German classifications of mental diseases, the fundamental understanding of the term "chronic incurable paranoia" is the same in all classifications of the leading psychiatrists. Thus, in Dr. Roubinovitch's work entitled "Des varietiés cliniques de la folie en France et en Allemagne," may be found the following comparative terminology in psychiatry:

"Paranoia of the Germans corresponds to all the systematized deliriums of the French. These systematized deliriums include the systematized delirium of Lasègue, chronic delusional insanity of systematic evolution of Magnan, delirium of the persécutés-persécuteurs of Falret, polymorphous delirium of sudden onset, of short duration and curable, of the degenerate, etc. The doctrine regarding the majority of these systematized deliriums is the same in France and in Germany. M. Magnan excepts chronic delusional insanity of systematic evolution, which, according to him, is never connected with hereditary or acquired predisposition."

We refrain from quoting any details, but the statements are substantially to the effect that Krafft-Ebing recognizes a chronic and incurable form of paranoia; that Schuele's doctrine on chronic paranoia (which he terms Wahnsinn) is substantially similar to that of Krafft-Ebing. Mendel's chronic paranoia is equivalent to Magnan's chronic delusional insanity of systematic evolution. And, we add, in the United States, the term paranoia has always been used in the sense of a chronic, progressive and incurable disease.

From this bird's-eye view of psychiatric terminology as it is used by the leading French and German alienists, it is evident that there is a uniformity in the conception of chronic incurable paranoia. But as is pointed out in the opening lines of the paragraph quoted,—the Germans do create a considerable confusion by their application of the term paranoia (without the specific qualification—chronic incurable) to all systematized deliriums of the French.

To the cosmopolitan student in psychiatry the French, and notably Magnan's, classifications of mental diseases stands out pre-eminently because of its adherence to clinical facts, its designation by terms that carry a clinical meaning with them and its great simplicity of grouping. The German terminology, on the contrary, totally lacks in simplicity in the name of the disease, and seldom, if ever, hints at the clinical picture of the affection.

Magnan classifies all mental diseases of the degenerate in one large group, the subdivision of which clearly indicate the clinical picture of the affection, as for instance:—episodic syndromes

(obsessions and impulses, etc.), systematized or unsystematized delirium (with or without disturbances of the general sensibility), simple or polymorphous, accompanied or not accompanied by accidental delirium of alcoholic, morphine, cocaine or other intoxications, etc., etc.; coexistence of obsessions and impulses and the various deliriums, etc., etc.; then come the presécutés-persécuteurs; the circular and recurrent forms of insanity; the neuroses (epilepsy, hysteria, etc.); insanities of organic nature (general paralysis of the insane, etc.). Chronic delusional insanity of systematic evolution (or paranoia) is in a group by itself, occurs in subjects free from hereditary or acquired predisposition and is progressive and incurable.

This classification, based on clinical facts, is as simple as it is free from such confusion of terminology as the German classifications necessarily suggest by their indiscriminate application of the term paranoia to all systematized deliriums.

Our own study of insanity leads us to consider Magnan's classification far clearer and truer to mental clinic than is any other in existence. It seems to us reasonable, therefore, that we should adopt his classification in the United States, where adherence to facts and clearness in all work is so highly prized—and justly so.

Many of our foreign colleagues eminent in psychiatry and neurology have often remarked that in France the patient conducts the clinic—by his clearness of expression and construction of language, leaving to the clinician the mere perfunctory task of labeling the disease. In Italy or Germany it is the physician who "drags out by the ears," so to speak, the patient's statements as to his complaint, suggesting words, sentences and whole paragraphs to the patient in his endeavor to make a verbal picture of his ailment.

Those familiar with clinics in different countries claim that the clearness of the French language explains the French patient's ability to give a precise description of his disease. There is, perhaps, truth in this theory. And the clearness of the French terminology is, no doubt, the result of this quality of the French language.

Terminology, after all, is nothing but a language robed in technicalities. If, then, the French have the gift of supplying the clearest technical names of mental diseases, we should, perhaps, accept the French classification of mental diseases.

Certain it is that we should be the gainers if we accepted Magnan's classification.

THE "SIMPLIFIED EXPERT ALIENIST."

The business of the "simplified expert alienist" consists in simplifying the science of psychiatry. His definitions of mental derangements are strictly *sui generis* and cannot, therefore, be found in any of the writings of standard authors or in standard dictionaries. Such terms as "paranoia" or "chronic delusional insanity of systematic evolution," or other terms designating chronic and incurable mental affections must be wholly excluded from his vocabulary. The field of activity of the "simplified expert alienist" is the courtroom, where he may appear for the purpose of making it possible either for sane gentlemen murderers to escape the penalty of the law, or for chronically insane gentlemen murderers to escape being landed in an asylum for insane criminals.

The "simplified expert alienist" may be fully informed on the law's provision regarding insane criminals or criminal insane. In the State of New York, for instance, this provision, relative to crimes committed by insane and trial of the insane, is embodied in Section No. 20 of the Penal Code and reads as follows:

"An act done by a person who is an idiot, imbecile, lunatic or insane, is not a crime.

"A person cannot be tried, sentenced to any punishment or punished for a crime when he is in a state of idiocy, imbecility, lunacy or insanity so as to be incapable of understanding the proceeding or making his defense."

Such subjects are to-day committed to asylums for criminal insane.

If the "simplified expert alienist" undertakes to aid an insane gentleman murderer in his endeavor to spend his days outside the enclosure of an asylum for insane criminals, he may so simplify the nomenclature of mental diseases that such terms as idiocy, imbecility, paranoia and other specific terms indicative of incurable mental diseases will be non-existent to him. And when hard pressed by everwhelming evidence for an opinion, he may specify the insane gentleman's mental status before the commission of the murder about as follows:

"Not perfectly healthy condition," but not insane; "unstable mentally but not insane"; "not lasting mental state but not insane"; "pathological suspect but not insane"; "on border line of insane instability and normal state but not insane." All these and similar definitions may apply to the gentleman murderer's mental status *before* the commission of the murder. At the very moment of the murder, the insane gentleman murderer may be found, however, to be suffering from a "brain storm" or a "brain explosion" and—is absolutely insane. But *after* the commission of the crime and at the time of the trial for murder, the insane gentleman murderer is perfectly sane.

Thus may the distinctive science of the "simplified expert alienist" enter as evidence in a murder trial. He further may fortify the value of his clinical conceptions of mental diseases by impressing upon the court the fact that he neither accepts nor agrees with any of the standard authors' appreciations of mental derangements, and his *sui generis* nomenclature must, therefore, be the only one applied to the case in hand. He may then manage, by virtue of the "rule of evidence," to keep from being kicked out of court as an imposter attempting to aid and abet crime and criminality and to unload dangerous homicidal insane gentlemen on a defenseless public.

Difficulties in upholding the value of such a "simplified" nomenclature of mental diseases may not have any deterring effect on the energies of the "simplified expert alienist." If, trapped by the people's attorney, he is forced to admit that the insane gentleman murderer is suffering from a chronic and incurable mental affection, the "simplified expert alienist" may still remain undaunted but be spurred on to further "stunts" in the simplification of the nomenclature of mental diseases; if the insane gentleman murderer *did* suffer from a chronic disease of the mind, the affliction may have manifested itself only in the shape of "outbursts," "brain storms" or "brain explosions" that came on at moments when the gentleman murderer was going to bed late at night and which left him early the following morning in a perfectly lucid mental state.

Now, can there be any simpler aspect of chronic mental disorders?

In fact, the "simplified expert alienist" may declare under oath having seen and studied cases of, say, dementia precox (a variety of insanity that may "burst" upon the victim at any time between the period of childhood and the first centenary birthday) that began, in repeated "outbursts," while the sufferer was enjoying the first pleasant dream of his night's sleep and left him early the following morning in a perfectly lucid condition of mind.

Not every psychiatrist is fortunate enough to observe such somnambulistic onsets and so sudden a disappearance at various times of a chronic mental affection; but the "simplified expert alienist" may be the exception to this rule.

These fortunate circumstances of the "simplified expert alienist," combined with the opportunity afforded by the "rule of evidence" may make it possible for insane gentlemen murderers to be foisted on a defenseless public. Besides, to the "simplified expert alienist" is due the credit of widening and enlarging the opportunities for applying this newest "outburst" of medical testimony in murder trials.

We earnestly hope, therefore, for the sake of equity, public safety and common decency that the present "rule of evidence" may be changed in the near future and so perfected as to make it an act of justice to the public on the part of the people's attorney to kick out of court the "simplified expert alienist" if he happens to appear therein in the rôle we have described, and neatly to kick him into jail if he happens to deliberately attempt to aid and abet crime, criminality and criminal acts.

INTERNATIONAL CONGRESS OF PSYCHIATRY, NEUROLOGY AND PSYCHOLOGY, TO BE HELD AT AMSTERDAM, HOLLAND, SEPTEMBER 2 TO 7, 1907.—This congress will be held under the auspices of Queen Wilhelmina and her royal consort, Prince Hendrick, of the Netherlands. Dr. G. Jelgersma, *Professor of neurology and psychiatry,* University of Leyden, is the President of the congress; Dr. W. P. Ruijsch, Vice-President; Professor VanDeventer and Dr. G. A. M. vanWayenburg, General Secretaries; Dr. A. Th. Moll, General Treasurer.

The American committee of this congress is constituted as follows:

NEW YORK: Drs. Carlos F. MacDonald, William Mabon, Charles W. Pilgrim, M. G. Schlapp, W. B. Pritchard, Louise G. Robinovitch.

PHILADELPHIA: Drs. S. Weir Mitchell, John K. Mitchell, Charles K. Mills, William G. Spiller.

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ST. LOUIS, MO.: Dr. C. H. Hughes.

MONTREAL, CANADA: Dr. Th. Burgess.

Price of subscription 20 francs. Subscriptions should be addressed to the General Secretary, Prinsengracht, 717, Amsterdam, Holland.

THE SEVENTEENTH CONGRESS OF ALIENISTS AND NEUROLOGISTS OF FRANCE will be held in Geneva-Lausanne, August, 1907. Subscriptions should be addressed to Dr. Long, 6, Rue Constantin, Geneva, Switzerland.

THE XVITH INTERNATIONAL MEDICAL CONGRESS will be held in Budapest, Hungary, August 29th to September 4th, 1909.

A NEW JOURNAL OF PSYCHIATRY.—"Sovremennaja Psychiatria" is the name of the new Russian monthly publication, that appeared in Moscow last month, under the direction of Drs. Soukhanoff, Gannoutchkine and others.

Woman. A Treatise on the Normal and Pathological Emotions of Feminine Love. For Physicians and Students in Medicine. With 22 drawings in the text. By BERNARD S. TALMEY, M.D., *Gynecologist to the Metropolitan Hospital and Dispensary.* The Stanley Press Corporation, Publishers, New York. The title sufficiently indicates the contents of this small volume of 228 pages. The author explains in the preface that this is not an original work, but is based on a number of works on psychology and psychiatry of sex and sexuality. The chapters on the history of love present interesting facts on love worship, showing that among the ancients the passion of love and the fervor of religion were closely interwoven. Sexual excitation and religious fervor in Christianity is touched upon. Some space is devoted to the description of normal sexuality, its use, abuse and abstinence. The chapters on the pathology of sexuality include: sexual anesthesia, orgasmus retardatus, orgasmus precox, hyperesthesia or erotomania, nymphomania, masturbation, incest, masochism, sadism, fetichism, homosexuality, sexual inversion, and zooerastia. Essentials for a happy union are indicated and the hygiene relating to sexual practices is considered. The author claims that civilization is daily forcing upon society various means for sexual excitation: the modern theater, public balls, at which young girls are allowed to dance with men, the modern novels, style of dress in woman and many other factors are powerful causes of sexual excitation.

L'Hysterie et la Neurasthenie Chez le Paysan. By DR. TERRIEN, *Director, Maison de Santé, Doulon-les-Nantes.* J. Siraudeau, Publisher. Angers, 1906. Hysteria and neurasthenia are prevalent among the peasants in France. The author's personal experience warrants his conclusion that hysteria is far more prevalent among the peasants than it is among city folks. Alcoholism of the parents at the time of conception of their offspring is mainly responsible for this trouble. Superstition as it is inculcated in the peasants' minds by religious teaching is another powerful factor in the development of the affection. Hysteria is defined as being a disease of persuasion—the subject persuades himself that he has paralysis, etc., and the origin of hysteria is heredity: one does not become hysterical but is born such. Numerous personal cases of hysterical paralysis of years' duration are cited, which the author cured within a few seconds by suggestion. His success with these deformed subjects was so marked that at

one time he was accused of using occult science in treating the ailments. Of all the forms of hysteria that accompanied by convulsive manifestations is the most difficult to treat. Neurasthenia is frequent among peasants, but is less so than among city people. The peasant's susceptibility and imitative power is marked, and the physician should be guarded in his tests for hysteria; simple but effective tests are indicated.

The little volume is the result of many years' practice among peasants as well as among the highest classes of society, and the author's facilities for a comparative study in this field of work lends great importance to its clinical value.

L'Opera Di Cesare Lombroso Nella Schienza e Nelle Sue Applicazioni. Scritti di: G. Amadei, G. Antonini e V. Tirelli, L. Borri, E. Bozzano, S. de Sanctis, L. Ellero, G. C. Ferrari e E. A. Renda, L. Ferriani, E. Ferri, E. Florian, B. Branchi, G. A. van Hamel, H. Kurella, A. Loria, C. E. Mariani e E. Audenino, A. Marro, E. Morselli, A. Niceforo, M. Nordau, S. Ottolenghi, L. Rancoroni, G. Sergi, A. Severi, S. Sieghele, A. Tamburini and P. Tarnovsky. Preface by Professor Leonardo Bianchi. Fratelli Bocca, Publishers, Turin, 1906.—This work was presented to Professor Lombroso on the occasion of the celebration of his jubilee. In the preface to this work Professor Bianchi gives general outlines of Professor Lombroso's achievements in the domain of criminal anthropology and says that what Charcot was to France in Neuropathology, Lombroso is to Italy in criminal anthropology; that Lombroso's teaching has withstood many unfounded attacks, has triumphed and will triumph still further with the better and more complete understanding of his teaching: here and there some exaggerations in his teachings have to be overlooked; but the Lombrosian school has come to stay. The various authors, whose names are mentioned in the title of this work consider Lombroso's works in relation to the following subjects: general anthropology; degenerative characteristics in man; normal and pathological psychology from the standpoint of the educator; supernormal psychology; application of experimental methods in the study of psychiatry; psychiatric nosographia; the theory on genius; pellagra; cretinism; legal medicine; forensic psychiatry; criminal anthropology; biological significance of degeneracy; prison discipline before and after Lombroso; juvenile delinquincy; relation to sociology and to collective psychology; Pinel and Lombroso; the evolution of Lombroso; Lombroso's scientific courage and scientific philosophy. Concluding the article on Lombroso's influence on scientific philoso-

phy, Prof. Morselli points out some of Lombroso's ideas on mind and matter: all animal force is a manifestation and effect of its material property; the physiology of a cell is the basis of its psychology, and experimental anthropology confirms the material basis of thought. A list of Lombroso's works during 1851-1905 is appended to this volume of 405 large octavo pages.

Text-Book of Psychiatry. A Psychological Study of Insanity for Practitioners and Students.—By Dr. E. Mendel, *A. O. Professor in the University of Berlin.* Translated, edited and enlarged by William C. Krauss, M.D., President Board of Managers Buffalo State Hospital for Insane. 311 pages. Crown Octavo. Price, $2.00. F. A. Davis Co., Publishers. The author states in the preface to this work that it is intended for students and physicians preparing to pass an examination in psychiatry, so that the content of the volume is necessarily elementary. The first part of this work, dealing with elementary notions on psychology and psychiatric symptoms takes up nearly one-half of the book. These elementary notions answer the purpose for which they were written. The description of individual mental diseases is less satisfactory, however, as the author has excluded clinical histories of individual mental diseases, substituting for these general descriptions. To the student and physician preparing to pass an examination all delusions, hallucinations and deliriums are alike, and a general description of a mental disease, or rather of many mental diseases, fails to make a special impression on his mind from the standpoint of a differential diagnosis; where a general description fails in this respect, a specific clinical history of a given mental disease is apt to leave a more definite impression on his mind as to the picture of the disease described; and besides, such clinical histories are valuable aids to the student who can refer to them on leaving his clinic. The whole part of this work dealing with general descriptions of mental diseases could be replaced by clinical histories of the respective diseases—to the student's advantage. The classification of mental diseases used in this work is confusing especially to beginners; under the heading of paranoia, for instance, are described obsessions and impulses, all the systematized deliriums of the insane as well as incurable paranoia properly speaking. The descriptions in general are colorless and lack clinical individuality, as may be judged from the five pages devoted to the description of "rudimentary paranoia"—meant for that of obsessions and impulses: a clinical history of obsessions and impulses, well presented and taking up only one page would

certainly leave a more concrete notion in the student's mind as regards the disease than does the description taking up five pages on the same subject. The same may be said of all the diseases described, and especially of alcoholic delirium and of post epileptic delirium, both of which lend themselves admirably to description in clinical histories. The translation is somewhat peculiar in wording, terminology and construction: "imperative concepts," for instance, is used instead of obsessions and impulses. Besides the fact that "concept" is an obsolete word, the term "imperative concepts" may not be substituted advantageously for obsessions and impulses, which give an exact word picture of the mental trouble as well as designate individually a state characterized by obsessions only, or one of obsessions ending in impulses. "Twilight state," for unconscious or subconscious state, is another of the vague terms used; and such expressions as "The state of dementia is *accustomed* in this type to appear earlier than," etc. (p. 206), are not calculated to please the ear of the English speaking public.

Hampa Afro-Cubana. Los Negros Brujos. Apuntes Para un Estudio de Etnologia Criminale. With 48 illustrations and a preface by Prof. C. Lombroso. By FERDINANDO ORITZ. Libreria de Fernando Fé, Madrid, 1906.—This volume contains an exhaustive study on ethnogeny in Cuba, and the religion, morality, customs and superstitions of the Cubans. Numerous illustrations are presented of their idols, devils and symbols employed in the practice of sorcery. Sorcery is most prevalent in Cuba, especially in those towns which are not frequented by civilized visitors. Religion is closely woven together with sorcery and with daring criminality that is often expressed by manslaughter. Sorcery often supplants the art of medicine as well as administration of law. The epileptic, the insane, the pregnant girl and subjects with all sorts of afflictions or grievances unhesitatingly apply to the sorcerer for advice and treatment. Manslaughter is often the result of these dealings. The laws against these practices are strict but rather ineffectual. The author cites a number of criminal cases of this kind, giving dates and indicating the papers from which they are quoted. The author claims that subjects of Spanish origin represent the higher type of civilization and intellectuality, while those of African origin are the lowest in intellect as well as in morality. These latter subjects are particularly given to the practice of sorcery and criminality. A chapter is devoted to the suggestion of measures for the suppression of these criminal practices.

Neurologie, Psychiatrie et Anthropologie Criminelle. Section VII of the report of the XVth International Congress of Medicine, Lisbonne, April 19-26, 1906. The following are the titles of papers contained in this volume: Physiopathologie de l'appareil médillaire sensitif (Les voie de la sensibilité dans la moelle de l'homme)—M. GRASSET. Le goître exophthalmique considéré comme maladie et comme syndrome—HASKOVEC. Nature et évolution de la catatonie—SIMON. La paranoia légitime. Son origine et nature—PEIXOTO and MOREIRA. Formes et pathogénie de la démence précoce—TSCHISCH. Nature et physiologie pathologique de la tabès—FERRIER. Les lésions cérébrales dans les psychoses d'origine toxiques—MOTT. Le goître exophthalmique considéré comme maladies et comme syndrome—MACHADO. Les lésions cérébrales dans les psychoses d'origine toxiques—BALLET and LAIGNEL-LAVASTINE. Nature et physiologie pathologique du tabès—EULENBURG. Reforme pénale au point de vue anthropologique et psychiatrique—VAN HAMEL. Prophylaxis and treatment of criminal recidivists—SUTHERLAND.

A Text-Book of Mental Diseases. By VLADIMIR SERBSKI, *Professor of Psychiatry, University of Moscow.* Pp. 573, large 8vo, Price, 3.50 roubles. Published by A. A. Levenson, Moscow, 1907. The first part of this work is devoted to the study of general psychopathology and the following subjects are treated of: the disturbances of the intellect, affective sphere, will power, consciousness, metabolic changes, etiology of mental diseases, pathological anatomy of mental diseases, method of examination, diagnosis, treatment and prognosis of mental diseases. The second part of the work is devoted to the study of individual forms of mental affections.

Professor Serbski is well known to the psychiatric world and we are all familiar with his erudition in psychiatry. In this, as in all his works, he is broad—presenting the views of the leading psychiatrists of our day—in Russia, Germany, France, Italy and elsewhere. All the schools are represented in this work—Krafft-Ebing, Kraepelin, Magnan, Korsakoff, etc., etc. The work is one of marked value, and Prof. Serbski deserves much credit for this exhaustive and up-to-date volume on mental diseases.

I Principi Fondamentali Della Antropologia Criminale. Guida per I Giudizi Medico-Forensi Nelle Questione di Imputabilita. GIUSEPPE ANTONINI, *Libero Docento in Psichiatria, Direttore del Manicomio Provinciale di Udine.* Ulrico Hoepli, Publisher, Milan, 1906. Price, 2 lire. This is a compendium on crimi-

nal anthropology. The latest views on criminal anthropology are presented, the criminal being looked upon as a diseased member of society who needs medical treatment. The advisability of building special asylums for the criminal insane and insane criminals is considered. Part of this little volume is devoted to the consideration of the various forms of mental disease.

Psychology Applied to Medicine. Introductory Studies.—By DAVID W. WELLS, M.D., *Lecturer in Mental Physiology, Boston University Medical School.* Illustrated, 141 pages, 12mo. Price, $1.50. F. A. Davis Co., Publishers. This is an elementary work on psychology written especially for the use of medical students. The subjects treated of are reason and instinct, habit, sensation, experimental psychology and hypnotism. The author apparently endorses reformed spelling, as he uses the words *thru, altho,* and *thoroly.*

Cesare Lombroso. Appunti Sulla Vita. le Opere.—By PAOLA AND GINA LOMBROSO. Fratelli Bocca, Turin, Publishers, 1906. This volume consists of a biographical sketch of Professor Cesare Lombroso by his two gifted daughters, one of whom, Gina, is herself a physician. The description of Professor Lombroso's early struggles as a student and as a Jew making his way against all odds and racial persecution is of more than passing interest. His scientific career is too well known to the profession to need any description; but the intimate knowledge of his private life enables the two biographers to lend a touch of charm to the whole volume, as they do not refrain from citing many humorous incidents and anecdotes relating to Professor Lombroso's intimate life.

The volume was presented to him last year, on the occasion of the celebration of his jubilee.

Les Therapeutiques Recentes Dans les Maladies Nerveuses.—By PROF. M. LANNOIS and DR. A. POROT. J. B. Ballière et Fils, Publishers. Paris, 1907. Pp. 96, in-16°. Price, 1.50 francs. The treatment of nervous diseases is considered under the following headings: lumbar puncture, re-education and tics, injection of mercurial preparations in nervous diseases of syphilitic nature, arsenical treatment of chorea, injection of gases or air in the treatment of neuralgia and neuritis. Although small in size this volume contains valuable reports of clinical cases in which these various forms of treatment have been tried.

Ueber die Psychologie der Dementia Praecox.—By Dr. C. G. Jung, *Privat Docent in Psychiatry, Zurich.* Carl Marhold, Publisher. Price, 2.50 marks. This volume contains an exhaustive study of the psychology of dementia precox. The German language lends itself particularly well to speculative theories in psychology and the author presents a full measure of such theorizing in this work. After a lengthy consideration of the psychology of dementia precox he draws a parallel between this disease and hysteria. The volume is full of interest and shows the author to be well versed in the subject of which he treats; the Germanic tendency to put psychiatry on a solid basis of psychology is much in evidence in this work.

Ueber Robert Schumanns Krankheit.—By P. J. Moebius. Carl Marhold, Publisher. Price, 1.50 marks. A detailed review of Schumann's mental disturbances is presented, the study being based on authentic documents and letters relating to the composer's spells of mental disease as well as to his last illness. The author concludes that Schumann's mental trouble was intimately connected with his insane heredity, but there is little, if any, proof that general paralysis of the insane was added to his hereditary mental affection from which he suffered at various times.

Ibsen's Nora vor dem Strafrichter und Phychiater.—By Dr. E. Wulffen. Carl Marhold, Publisher. Price, 1.20 marks. Ibsen's "Nora" (the "House of Dolls") presents a scientific illustration of feminine hysteria—with its moral depravity, selfishness and criminality. The legal case which Ibsen shapes in this play is perfect in its construction as well as in its complicaton. The author remarks in this monograph that Ibsen took great interest in medical studies. This may explain Ibsen's knowledge of the psychology or rather psychiatry in hysteria.

Was sind Zwangsvorgaenge?—By Dr. Bumke, *Privat-Docent Freiburg Psychiatric Clinic.* Carl Marhold, Publisher. Price, 1.50 marks. The author reviews the use and abuse of the terms Zwangsvorgaenge, Zwangsvorstellung, Zwangszustand, Zwangsaffekten, etc.; many psychiatric disturbances have been designated by these various terms without any clinical foundation for such designations. If the terms are meant to apply to diseases designated by Magnan as "obsessions," it would be advisable to accept Moebius's suggestion to substitute for them the term "Besëssenheit."

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THE DEVELOPMENT OF THE MODERN CARE AND TREATMENT OF THE INSANE, AS ILLUSTRATED BY THE STATE HOSPITAL SYSTEM OF NEW YORK.*

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Delegate from the United States Government to the International Congress of Neurology, Psychiatry, Psychology and Care of the Insane, Amsterdam, Holland, September 2-7, 1907, and Chairman of the American Delegation to the Congress.

The subject of my remarks on this occasion—the development of the modern care and treatment of the insane, as illustrated by the State Hospital system of New York—is naturally suggested by one of the principal objects for which this body of distinguished representatives of medical science are assembled in international congress, namely, the advancement of psychiatry, of which branch of medicine the care and treatment of the mentally afflicted is an integral part. The pertinence of my theme was further suggested by recollections based on personal observations and experiences since I entered upon the work of caring for the insane, in 1870, during which time it was my privilege to witness the progress and to participate to some extent in the efforts made in my country to reform the methods of caring for the insane, especially as regards the use of mechanical restraints and punish-

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ments of various kinds, and the abolition of a barbarous system of so-called "county care" and the substitution therefor of the modern hospital for the insane.

Among the many serious problems with which States and communities are confronted to-day, there is probably none that rivals in importance, whether viewed from a medical, social, economic or philanthropic standpoint, that of securing, at a minimum cost, proper care and treatment to the vast army of dependent sufferers from that most serious, most dangerous and most far-reaching in effect of all diseases known to medical science—insanity. But above and beyond all this, the great fact remains that, in considering the subject of the care and treatment of the insane, the highest place should be given to its humane aspect. Aside from its humane aspects, however, which must always be regarded as of primary importance, since the claims of suffering humanity take precedence of merely material or pecuniary policies, the financial side of the problem involving, as it does, even under the most economical methods, the expenditure of vast sums of money for lands and buildings, with their equipment and furniture, besides an enormous annual outlay for maintenance, repairs, renewals and enlargements, may well command the most serious attention and co-operation of the legislator, the political economist, the taxpayer and the humanitarian.

Turning for a moment to a consideration of the humane side of the question, it will be conceded that of all diseases which afflict mankind, insanity is by far the most frequent, most widely prevalent, and most far-reaching in its effects, whether as regards the interests of the afflicted individual, or of his family, or of the commonwealth; that a vast majority of its victims must, during its existence, be deprived of personal liberty and removed from their homes, to be cared for in institutions established and maintained at public expense; that among the dependent insane are to be found numerous representatives of all professions, trades, and occupations, whose financial, social, and intellectual status may have been of a high order, and most of whom were respectable, self-supporting citizens—many of them taxpayers—prior to the onset of their disease; that the commonwealth is in duty bound to provide these dependent sufferers with suitable shelter, food and raiment, together with means of occupation and diversion, and competent medical care and supervision.

It need hardly be said that in the consideration of this question humanity should have the first place, but it must also be admitted that its economy must have a prominent place. Hence, it follows that that policy ought to be pursued which will, first of all, secure

everything that is essential to proper care and treatment, and, at the same time, limit the cost to such sums as the truest economy for the State would suggest. In other words, the dictates of humanity demand that the insane shall be amply provided with everything which medical science has determined to be essential to the recovery of those who are recoverable, as well as for the proper care, comfort, and amelioration of those who remain unrecovered. In fact, no system for the care and treatment of the dependent insane can be successfully administered which is not sustained in its ordinary operation by the highest order of human emotions; no system can be fairly regarded as good which directly or indirectly relies upon the lowest order of these emotions. Cupidity and self-interest should have no sway where suffering humanity is concerned.

In support of the claim here indicated respecting the importance of mental as compared with other diseases, mention may be made of the trite facts that insanity is a disease which invades all classes of society, and one from which no one can claim exemption; that it involves to its victim, to his immediate friends, and to the community, a wider range of interests than any other disease. To the individual it involves a loss or perversion of reason; also, in most cases, a loss of personal liberty, the loss of control of his property and affairs, a disturbance or destruction of his social and business relations, enforced separation from his family, and, if his disease happens to take an unhappy form, it involves great mental anguish and suffering, and, possibly, the loss of his life through self-destruction or exhaustion; or, if the case fails of recovery, it may involve in addition to these, a prolonged and often weary existence, which might properly be termed "a living death." To the individual's family it involves great anxiety and distress, occasioned by the sad spectacle of a loved one with reason dethroned and the putting of this loved one away in the care of strangers; it also involves the stigma which society unfortunately and wrongfully attaches to the taint of insanity, and which is usually regarded by the relatives of the sufferer as something akin to shame and disgrace. It involves, frequently, a cutting off of the source of income, especially if the afflicted one be the breadwinner of the family; also the added expense of commitment to and maintenance in a hospital for the insane; and finally, it involves exposure of the lives and property of the family to danger from the oftimes violent and destructive tendencies of the patient. To the community it involves great danger to life and property from the acts of homicidal and dangerous lunatics; also a large loss to the body politic by the with-

drawal from the ranks of its wage earners of the earning capacity of many thousands of individuals—substantially all of the insane being adults and, for the most part, in the active and most productive stage of life; and last, though by no means least, it devolves upon the community an enormous burden of taxation incident to providing and maintaining hospitals for the custody and care of a vast army of insane people, there being to-day in the State of New York alone more than 28,000 certified lunatics, not to mention the large number of unapprehended, unrecognized and so-called "borderland cases" in all communities, that are liable at any time to require medical care and attention.

With respect to its bearing upon the importance of the subject from a pecuniary standpoint, mention may be made of the fact that in the development of the wealth of the State the life of each adult unit of a community has an estimated value of $200 per annum, whereas, the average duration of insane life is about twelve years and the average annual cost of properly caring for an insane person in a public institution, including interest on investment, is in the United States about $200. This would indicate a loss to the State of approximately $400 for each year that a patient remains under care as a public charge. In other words, if the average life of the insane is twelve years and the annual per-capita cost of maintenance is $200, each insane person who fails of recovery during this period represents a loss to the State of $2,400; whereas, a sane person for a like period of time would represent a gain of $2,400. But even though the individual contribute nothing to the wealth of the State when sane, it would still be in the interest of economy to provide for him when he becomes insane, such environment and such treatment as will insure every opportunity of restoring him to the ranks of the wage-earners, or at least of enabling him to return to his home, and thus relieve the public of the burden of his support. By restoring a sick man to health we not only enable him to resume the support of his family, which otherwise might become a public burden, but we pave the way for him to again become an industrial unit in the community, whereby he may contribute his portion to the public weal.

At the present time there are in the State of New York fifteen State hospitals for the insane—thirteen for the ordinary insane and two for insane criminals—and twenty-three licensed private institutions for the insane. The whole number of committed insane in the public and private hospitals of the State of New York at the end of the fiscal year, September 30, 1906, was 28,302, divided as follows:—men, 13,548; women, 14,754. The whole num-

ber of insane in the State hospitals, including two hospitals for insane criminals (960) on September 30, 1906, was 27,317. The whole number of insane in licensed private institutions was 985. The net increase for the year in all institutions was 895; in the State hospitals, including the criminal asylums, the net increase was 896. The number of resident medical and other officers in State hospitals is about 300, and of attendants, nurses and other subordinate employes, 3,500.

The cost of the State hospitals, for lands, buildings, equipments and furniture, represents a permanent investment of more than $26,000,000, while the average annual expenditure for their maintenance, exclusive of cost of repairs, renewals and enlargements, is about $5,000,000. The average weekly per capita cost of maintenance for the last fiscal year being $3.53. This weekly rate is somewhat higher than the average for the whole United States, in which the number of insane is roughly estimated at 200,000.

If we estimate, even approximately, the cost of providing for and supporting the insane of the entire civilized world upon this basis, or even on a much lower one for some countries, the magnitude and importance of the subject at once becomes apparent.

The foregoing statement of facts and figures is here presented merely for the purpose of calling attention by way of introduction to the magnitude and importance of the disease under consideration and as suggestive of the wide range of interests it involves, whether viewed from a professional, sociological or economical standpoint.

The first attempt on the part of the State of New York to provide State care for her insane was made nearly sixty years ago when, in 1836, the Legislature, in response to a memorial from the Medical Society of the State of New York, praying for the establishment of a suitable State asylum for the insane, created the State Lunatic Asylum at Utica, now the Utica State Hospital. The institution, however, was not opened for the reception of patients until January, 1843. The establishment of this asylum was the first recognition by the State of New York of the principle of State care. Prior to that time the insane poor, both acute and chronic, were mostly cared for in county or town poorhouses or in jails, there being substantially no other provision for them. Provision was made in the original charter of the Utica Asylum whereby patients who failed to recover after a certain period of time, or who should be pronounced incurable, might be removed to the county poorhouse, upon the superintendent's certificate that the patient was "incurable" or "not likely to be benefited by further treatment, and could probably be made comfortable in the

poorhouse." This was a most inhumane provision, and one that was continued in operation under certain modifications, though with practically the same results, until the creation of the State Commission in Lunacy in 1889, and the subsequent passage of the State Care Act in 1890. So that, while the establishment of the State Lunatic Asylum in Utica in 1836, was a practical recognition on the part of the people of the State of New York of the principle of State care, its beneficence extended only to State care for the acute or recent insane, while at the same time it countenanced, or at least tolerated, a system of county or poorhouse care in its worst form by permitting the superintendent of the State asylum, in his discretion, to transfer to county houses, under the guise of incurability, the friendless, the violent and destructive, the filthy and infirm, and the feeble and helpless—the very classes which, above all others, most need the fostering care and protection of the State. This pernicious system continued for a period of more than forty years, during which time the poorhouses became filled to overflowing with mentally afflicted human beings, who were accorded only the merest pretence of custodial care and maintained in a spirit of parsimony whose chief apparent ambition was to see on how small a pittance a body and soul could be kept together. The keeper of one county asylum stated to the writer with evident pride in 1889—the year the State Commission in Lunacy was created—that he maintained the insane of his county at a cost of ninety cents a week, per capita, or less than thirteen cents per day.

This accumulation of the insane in the county poorhouses and in so-called "county asylums" which, excepting those in urban districts, were destitute even of a nominal medical head, resulted in their being treated as ordinary paupers, the character of their malady being ignored or unappreciated, and they received no more care or attention than was accorded to the sane paupers. In other words, the insane were pauperized in the matter of food, clothing, shelter and environment, as well as of proper medical care and treatment. Experienced observers of mental disease, and of the natural tendencies of its victims, will readily imagine what, under such circumstances, the condition of the insane in the State of New York must have been at that time, a condition best described by the terms, misery, degradation, squalor, wretchedness and neglect.

The standard of care in the State of New York at that time, and its resultant conditions, are graphically portrayed in the following extract from a report made to the Legislature in 1864 by the late Dr. Sylvester D. Willard, Secretary of the New York

State Medical Society, who, although not an alienist, was a humanitarian, personally investigated the condition of the insane poor in the various poorhouses, county insane asylums and other institutions where the insane poor were kept:

"In some of these buildings the insane are kept in cages and cells, dark and prison-like, as if they were convicts, instead of the life-weary, deprived of reason. They are in numerous instances left to sleep on straw, like animals, without other bedding, and there are scores who endure the piercing cold and frost of winter without either shoes or stockings being provided for them; they are pauper lunatics, and shut out from the charity of the world where they could at least beg shoes. Insane, in a narrow cell, perhaps without clothing, sleeping on straw or in a bunk, receiving air and light and warmth only through a rough, prison-like door; bereft of sympathy and of social life, except it be with a fellow lunatic, without a cheering influence or a bright hope for the future! The violent have only to rave and become more violent, and pace in madness their miserable apartments. These institutions afford no possible means for the various grades of the insane; the old and the young, the timid and the brazen, the sick, the feeble and the violent, are herded together without distinction as to the character or degree of their madness, and the natural tendency is for all to become irretrievably worse. In some violent cases the clothing is torn and strewed about the apartments, and the lunatics continue to exist in wretched nakedness, having no clothing and sleeping upon straw wet and filthy with excrement, and unchanged for several days. * * * Can any picture be more dismal? and yet it is not overdrawn."

The publication of this report aroused public sentiment and resulted in a second spasmodic effort on the part of the Legislature to provide for State care of the chronic insane by the establishment, in 1865, of the Willard Asylum for the Chronic Insane, now the Willard State Hospital, and subsequently, in 1879, the Binghamton Asylum for Chronic Insane, now the Binghamton State Hospital, to which it was proposed to transfer all of the insane from the county poorhouse asylum where they had accumulated in large numbers. This second era in lunacy legislation for State care largely failed of its object through delay on the part of the State in providing sufficient accommodations for this class, notwithstanding the fact that in the period from 1865 to 1889 seven State asylums—five for acute and two for chronic cases—had been established. Owing to this lack of accommodation, the State asylums for the acute insane were permitted by law to continue the pernicious practice of returning their unre-

covered patients to the county poorhouses, some of which were called "county asylums." The inhumane practice of removing these unfortunates from State asylum to poorhouse, usually at the end of one year, continued under certain modifications, though with practically the same results, for upward of half a century, or until the creation of the State Commission in Lunacy in 1889, and the enactment of the State Care law in 1890. Thus, while the State had recognized the principle and, at least theoretically, adopted the policy of State care for its dependent insane, it had fostered a system of county care in its worst form and one which pauperized substantially every patient who failed of recovery after a year's residence in a State asylum.

It should be borne in mind that a large majority of the dependent insane, of which the great bulk of our hospital population is composed, are not paupers in any proper sense of the term. A pauper is one who was a pauper and a public charge before he became insane, whereas, the great mass of the inmates of our State hospitals are persons who were self-supporting, respectable citizens when overtaken by disease and as such they are clearly entitled to receive the highest standard of care and treatment, to the end that as many as possible may be restored to lives of usefulness and to the ranks of the bread-winners.

Another evil which sprang up in connection with this wretched county care system, and which had become an integral part of it, was a practice of receiving recent and presumably recoverable cases directly from their homes, which was not only violation of law, but a great moral wrong.

This deplorable condition of the insane in poorhouses and county asylums at last became so acute that it attracted the attention of certain philanthropic people and especially of a charitable organization known as the State Charities Aid Association, a voluntary body, which in its visitation of county asylums and poorhouses by local committees had become familiar with the existing evils.

This association, although without legal authority to correct the abuses which its local visitors reported, under the leadership of the chairman of its Committee on the Insane, Miss Louisa Lee Schuyler, began a reform agitation, through the public press, and by personal appeals to Legislators, to the medical profession and to other influential public-spirited citizens. This agitation, continued in the face of powerful opposition, gradually gained force until it culminated, after two unsuccessful efforts, in the enactment of the State Care law in 1890. Meanwhile, the Legislature, having become convinced of the futility of enacting laws for the

improvement of the condition of the insane without providing adequate legal machinery to enforce the same, passed a law, in 1889, creating a State Commission in Lunacy and clothing it with practically plenary power in respect to the insane and the management of institutions for the insane, both public and private.

This Commission, over whose deliberations I had the honor of presiding during the first seven years of its existence, consists of three members, with the following required qualifications: A physician of at least ten years' experience in the care and treatment of the insane and in the management of institutions for the insane; a lawyer of at least ten years' practice, and a layman of good repute, all to be appointed by the Governor of the State, with the concurrence of the Senate. My associate commissioners were Hon. Goodwin Brown, lawyer, and Hon. Henry A. Reeves, citizen, both of whom rendered invaluable service in organizing the work of the Commission and putting the State Care law into successful operation. The creation of this Commission gave a powerful impetus to the State care movement. It promptly joined hands with the State Charities Aid Association and others in their efforts in behalf of State care and in the first year of its existence (1889) it made a thorough examination of the county institutions for the insane, twenty-one in all, in many of which the conditions were found to be nearly as bad as those so vividly portrayed in Dr. Willard's report. Most of the buildings were found to be utterly unsuited to their purpose, both as regards their structural arrangement and equipment. They also were woefully lacking in respect to sanitary appliances, furniture, bedding, clothing, food supplies, order and cleanliness, facilities for diversion and amusement, religious worship, nursing and competent medical supervision. In several instances disturbed and violent insane women were cared for by male keepers who were devoid of any proper training or experience in nursing the insane. Crude methods of mechanical restraint and other forceful means of repression were commonly resorted to to quell the violence and turbulence which existed on every hand, and which, coupled with the general conditions of confusion, disorder and untidiness that prevailed, served to render some of these institutions veritable bedlams. Indeed, so glaring were the defects found by the Commission on its first inspection of these institutions that it immediately issued an order declining to grant any further permission to county officials to care for their insane. In its first report to the Legislature the Commission disclosed the wretched condition of these institutions and their inmates and recommended the abolition of the county care system and the transfer of all of the inmates of such institu-

tions to State hospitals, there to be maintained solely at the expense of the State. This report, which attracted wide attention through the medical and secular press, it is generally conceded, gave the death-blow to county care of the insane in the State of New York. In response to the recommendation of the Commission, and despite an organized, vigorous and determined opposition on the part of county officials and their numerous sympathisers, the Legislature, in 1890, passed and the Governor approved an act, known as the State Care Act, which annihilated the county care system and provided that all of the dependent insane of the State shall be treated in hospitals established, maintained and governed by the State. Of this law the *American Journal of Insanity* for April, 1890, speaks in the following language: "The State Care Bill, providing State care for all the dependent insane in the State of New York, became a law April 15, 1890. By signing this bill Governor Hill consummated one of the most signal triumphs ever achieved by humanity in the State of New York. All honor to those good men and women who have labored zealously day in and day out for the past three years to bring about this happy result. In the general rejoicing there will be no caviling as to who is entitled to the lion's share of the credit, though all must recognize the important part played in this great reform by the State Commission in Lunacy." In this connection it should be said that the Commission was sustained by the medical profession as a whole and by the unremitting efforts of the State Charities Aid Association.

By the adoption of the State Care Act, the State of New York not only emphatically reaffirmed its policy of State care, which began in 1836, and which was extended in a half-hearted way in 1865, but unequivocally committed itself to the extreme and logical limit of the principle, in fact as well as in theory, that the dependent insane are the wards of the State, and that the interest and maintenance of the insane should be confided exclusively to the State; while the terms of the act render it easily workable and susceptible of unlimited extension to meet the increasing demands which may from time to time be made upon it.

The important features of the State Care Act (Chap. 126, Laws of 1890), and of acts supplementary thereto, may be briefly summarized as follows: The abolition of separate institutions for the *chronic* insane; the designation of all the public institutions for the insane as State Hospitals; the territorial division of the State into hospital districts, and requiring that each hospital shall receive all of the dependent insane, both acute and chronic, within its district; providing for the erection on the grounds of the State

hospitals of additional buildings to accommodate the inmates of county asylums, then numbering nearly 2,300; also requiring the Commission, whenever deemed necessary to prevent overcrowding, to enlarge existing hospitals or to recommend the establishment of additional hospitals in such parts of the State as in its judgment will best meet the requirements; requiring county superintendents of the poor and other officials of similar jurisdiction to properly prepare patients for removal to hospitals by seeing that they are in a state of bodily cleanliness and comfortably clad in new clothing throughout and adapted to the season of the year, in accordance with regulations made by the Commission; providing that the removal of public patients from their homes or from poorhouses shall be done by nurses sent from the hospitals, and that female patients, unless accompanied by relatives, must be removed by female attendants, the cost of removal in all cases to be borne by the hospital; that after such patients have been delivered into the custody of the hospital the care and control of them by county authorities shall cease; that thereafter no insane person shall be permitted to remain under county or municipal care, but all such shall be transferred to State hospitals without unnecessary delay, there to be regarded and known as the wards of the State; also prohibiting absolutely the return of any insane person from a State hospital to the care of county officials; also providing that no money shall be expended by the managers of a hospital for additional buildings or for extraordinary repairs and improvements except upon plans and specifications approved by the Commission; also, that no expenditure for any other purpose shall be made by the hospitals except upon itemized estimates approved by the Commission; requiring the hospitals to submit to the Commission bi-monthly, itemized estimates for their current expenditures, these estimates to be revised by it as to quantities, quality and cost of supplies; requiring the Commission to classify the salaries and wages of officers and employes of the hospitals on a basis of uniformity for similar ranks and grades of employment; requiring uniformity in all official records and forms used by the hospitals; providing for the establishment of a Pathologic Institute to be maintained for the benefit of all the hospitals, the director of the institute to be appointed by the Commission after a special civil service examination, thus centralizing in one department the scientific investigation of all the hospitals in the yet obscure domains of mental pathology, and etiology of insantity and correlated fields of research.

Having thus cursorily outlined the legislation for the insane in

the State of New York since the creation of the Commission in Lunacy in 1889, it is pertinent to inquire into the results of this legislation, both as regards the welfare of the insane and the pecuniary interests of the people. In other words, what improvements, if any, have been made in the general care and treatment of the insane and in the methods of management and condition of the hospitals? Also what pecuniary benefits have the people derived from the substitution of State for county care for their dependent insane?

Among the more important improvements as regards methods and conditions which have accrued to the institutions for the insane and their government, under the new order of things, may be mentioned the following:

1. A complete registration in the office of the Commission of all qualified examiners in lunacy; in the State of New York only qualified examiners in lunacy may certify to the insanity of a person for the purpose of commitment. To become an examiner one must be a reputable and duly licensed physician of at least three years' standing. These qualifications must be certified to by a judge of a court of record and the certificate filed in the office of the Lunacy Commission.

2. A complete registration in the office of the Commission of all persons committed to institutions for the insane, both public and private. This registration already embraces about 75,000 cases of insanity, from which valuable deductions and comparisons may be made. This information, which heretofore could not be obtained from a single source, nor without great difficulty, is thus made readily available. The collection of this information has been greatly facilitated by the adoption of a uniform system of records and statistical returns for all the hospitals.

3. Provision for the transfer by order of the Commission of patients from one institution to another without recommitment. This elastic feature of the State Care Law enables the Commission to locate patients in hospitals which are most accessible to their friends; also to equalize the pressure for accommodations in the State hospital system.

4. The removal of patients from their homes or elsewhere by trained attendants sent from the hospitals, women patients, in all cases, to be accompanied by a woman attendant or nurse. Also if the patient is violent or greatly disturbed, a medical officer from the hospital accompanies the nurse. The observation of this rule insures both decency and humanity in bringing patients to the hospitals. Formerly it was customary for male officers to escort

female patients to the hospitals, even though it might be necessary, as was frequently the case, to stop over night en route. Again such patients were frequently required to travel long distances in smoking cars set apart for men, grossly improper practices which, happily, are now a thing of the past.

5. Removal of the legal distinction between acute and chronic insanity by designating each State institution for the insane as "hospital" instead of "asylum," and organizing them all upon a curative basis, thus inculcating the hospital idea. While it is true that the State Asylums for the chronic insane, as they were then designated, served a useful purpose, inasmuch as they afforded asylum, not hospital, care, for a large number of patients who otherwise would have been consigned to the poorhouses, there was a feeling in the community, and especially among the patients themselves and their friends, that patients sent to the Willard Asylum were thereafter to be regarded as hopeless and incurable, and the transfer of patients thereto from the so-called acute institutions of the State was the occasion of much mental anguish and suffering on the part of both patients and friends. Indeed, I have personally witnessed the sorrow and anguish which patients manifested when marshalled in the wards of the Utica State Hospital for transfer to the Willard Asylum for the Chronic Insane. Many of such patients, capable of appreciating their situation and surroundings, felt when consigned to the asylum for the chronic insane, that all interest in their welfare, and especially in their recovery, was lost. And it is a fact that in numerous instances when patients were so consigned, their friends did lose interest in them and ceased to visit them.

Furthermore, the abolition of this distinction has had a most beneficial effect upon the inmates of the institutions, that formerly were set apart for the chronic insane, as well as upon the interest and zeal of their medical officers and nurses.

6. A regulation regarding the correspondence of the insane, which provides that any patient who desires to do so may write at least once in two weeks; letters, for any reason, not forwarded to destination, must be sent to the office of the Commission for examination; letters addressed to the Governor of the State, the Lunacy Commission, to judges or to any official having jurisdiction in lunacy cases, must be forwarded unopened. This rule is designed to disarm the criticism that is so often made respecting alleged suppression of patients' correspondence by hospital officials, and at the same time to afford patients who regard themselves as illegally detained or ill-treated, an opportunity to communicate through proper channels with the outside world.

7. Provision for paroling patients, under certain conditions, for a period of thirty days, during which they may be returned to the hospital without recommitment. This affords opportunity for testing the fitness of certain patients for final discharge, and to others for occasional visits at home.

8. A regulation requiring that patients on admission to a hospital shall be informed of the nature of the institution, and the fact that they are detained under legal commitment.

9. Affording all patients the legal right of a hearing by the visiting commissioners, apart from any officer of the hospital.

10. A rule restricting the issuing of licenses to conduct private asylums to reputable physicians of at least five years' experience in the care and treatment of the insane.

11. The general adoption by the hospitals of a uniform dress for nurses' and attendants' wear.

12. Provision for the clinical teaching of insanity in the State hospitals by admitting to the wards thereof, under proper restrictions, students of medical colleges situated in their vicinity, as well as practising physicians who may desire the opportunity of studying mental diseases clinically. Under this provision six medical colleges now avail themselves of the facilities offered by the hospitals for the clinical teaching of insanity.

13. Provision for the appointment of medical internes in each of the State hospitals at a salary of $600 per annum, in addition to the regular medical staff, thus providing a training school for medical officers, from which the regular medical staff may be recruited.

14. A regulation requiring competitive civil service examinations for appointment of resident officers in State hospitals. This provision has resulted in divorcing the hospital service from partisan influences, and in opening the way for promotion, by merit, of experienced assistant physicians and other worthy officers. Only physicians who have had at least five years' experience in a hospital for the insane are eligible to examination for and appointment to the position of superintendent. This regulation has effectually barred the appointment to office of inexperienced and incompetent physicians through political or other influence, as was heretofore too frequently the case. It is believed that the letter and spirit of civil service requirements are more carefully observed in the State hospitals of New York than in any other department of the State government, and that under its operation the hospitals are as free from partisan influences, both in the matter of appointments and in the tenure of office during efficiency

and fitness, as it is possible to have them under a republican form of government.

15. A material increase in the average rates of salaries and wages of all grades of service, also an increase in the ratio of medical officers, nurses, and attendants to patients including a woman physician, on the staff of each hospital. The schedule of salaries and wages provides, in nearly all cases, for promotion in pay at regular intervals, as a matter of right and independently of favoritism.

16. The introduction of women nurses on the men's wards, such nurses to be paid the same wages as men.

17. A material extension of accommodation for attendants and nurses in detached buildings, or nurses' homes, and the employment of a corps of night nurses, especially in the care of disturbed and untidy patients. This arrangement enables the nurses, both night and day, when off duty, to retire to their own, well appointed, quiet apartments where they may obtain needed rest and relaxation.

18. The establishment of training schools for nurses in all the hospitals.

19. Provision for the employment of dentists for patients whose teeth the medical officers may determine to be in need of attention, also for ophthalmological examination by eye specialists with a view to the correction of defects of vision, from which many patients suffer.

20. An annual allowance to each hospital for the purchase of medical books and journals, magazines and other periodicals, for the benefit of the medical staff and others.

21. The employment of a chef in each hospital, in addition to the ordinary corps of cooks, whose duty it shall be to generally supervise the cooking in the various kitchens and to instruct the subordinate cooks and nurses in the preparation of special diet.

22. The adoption of a schedule of food supplies, including a per diem ration allowance of each article. This schedule is designed to serve as a basis for the hospitals in estimating for commissary supplies, and also as a guide for the Commission in its revision of such estimates.

23. A marked improvement in the methods of bathing, by the introduction of "rain" or "spray" baths and other hydrotherapy.

24. A requirement that, so far as may be deemed feasible, the hospitals shall enter into joint contracts for the purchase of staple articles of supply through competitive bids, the contracts to be let to the lowest responsible bidders.

25. The abolition of mechanical restraints in all the hospitals and the substitution therefor of useful occupations, diversions and amusements of various kinds. Prior to the enactment of the State care law the wards of substantially every asylum were supplied with camisoles, leathern muffs, belts and wristlets, protection sheets, etc., and many of them also with the "Utica Crib," so called from having first been used in the Utica Asylum. In addition to these forms of restraint the wards of the Auburn Criminal Asylum, when I became its superintendent in 1876, were equipped with an outfit of chains, shackles and hand-cuffs, many of which were in daily use. At that time, as a result of the teachings I had imbibed, I believed in the utility of mechanical restraints and would have regarded a failure to use them in certain cases as a dereliction of duty, and I so stated in my annual report for that year. Subsequently, however, on January 1, 1879, after careful study of the subject, I determined to discontinue the use of mechanical restraints in the institutions absolutely and I accordingly issued an order therefore to take effect on that date. This, I believe, was the first instance in the United States of the absolute abolition of mechanical restraint in a public institution for the insane. This, at the time, seemed a long step in advance and one the propriety of which was seriously questioned by several of my fellow superintendents. But soon after the step was taken it was found that the need of these appliances had ceased to exist, and that under the beneficent influences of amusements, diversions and useful occupations, together with adornments of the wards and surroundings of the patients, quiet and order had soon supplanted the turbulence, confusion and violence which attended the old methods and which rendered the institution a veritable bedlam. In the days of restraint it was really dangerous for visitors to pass through certain of the "disturbed" wards of our public institutions for the insane, whereas, nowadays, visitors to these institutions not infrequently complain that they have not been shown the "worst cases," and they ask to see those who are in "padded cells" or "tied down," and when told that there are no such cases, or places, in the hospital, they are apt to look incredulous and doubting. So that, even to-day it is difficult for those who are unfamiliar with the subject to realize that the old conditions have entirely disappeared under modern methods of care and treatment.

26. The introduction in 1901, of tent life for the care of tuberculous patients, by the late Dr. A. E. Macdonald, Superintendent of the Manhattan State Hospital, on Ward's Island, New York City, marks another important step in the progress of the care

and treatment of the insane in New York which is worthy of special mention.

The pronounced success of Dr. Macdonald's experiment of treating tuberculous insane in canvas tents during the milder season and which was subsequently extended to all seasons of the year, has led to the extension, with most beneficial results, of tent treatment to several other classes of patients, namely, the feeble and untidy, the convalescents, and finally, to the acute insane, many of whom, confined to bed and suffering from various concurrent diseases, find in camp life an agreeable and beneficial change from the more confined surroundings and vitiated air of the hospital ward. Dr. William Mabon, the present superintendent of this hospital, in a recent paper states that the recovery rate of cases cared for in the open air is as high as 40 per cent., whereas, the death rate is "extremely low." The experience of this hospital during the past five years shows that the open air treatment is especially beneficial to the tuberculous, the feeble and untidy, the retarded convalescents and the acute insane in which the psychosis is associated with debility, delirium and insomnia.* Fully equipped camps for both sexes are now maintained at this hospital in which large numbers of patients receive the same general routine treatment that is given to indoor cases with the added benefit incident to life in the open air. This system of outdoor treatment of the insane is gradually being adopted by other hospitals, both in New York and in other States.

27. The systematic employment of patients at useful occupations, such as farm and garden work, in the various repair shops, bakeries, kitchens, laundries, tailor shops, sewing rooms, stables, etc. Also at various industrial occupations, such as the manufacture of clothing and foot wear, furniture, brooms and brushes of all kinds, hair mattresses, rugs, upholstering, chair caning, bookbinding, printing, etc., etc. The finished products of these industries are not sold in open market, but are disposed of at actual cost to other hospitals which may not manufacture or produce the particular article, thus avoiding direct competition with trades unions. For instance, one hospital roasts all the coffee, or manufactures all the brushes, or supplies all the printed blank forms that may be required by the other hospitals.

* Those who may desire detailed information respecting the methods and results of tent treatment of the insane in New York are referred to the annual printed reports of Manhattan State Hospital (1901 to 1906); also to a paper on Tent Treatment for Tuberculous Insane (illustrated) by A. E. Macdonald, M.D., reprinted from A Directory of Institutions and Societies Dealing with Tuberculosis in the United States and Canada, 1904; also Open Air Psychiatry by Dr. William Mabon, *N. Y. Medical Journal,* February 9, 1907.

28. The establishment of a Pathological Institute: Criticism having been made from time to time by eminent members of the medical profession, of the indifference and inattention of the hospitals for the insane generally throughout the United States to scientific investigation, the Lunacy Commission, after first securing the material welfare of the insane, as regards their proper housing and care, proceeded to establish a department of scientific investigation of mental diseases. This centre of scientific investigation in insanity and allied fields of research was designated the Pathological Institute of the State Hospitals, to indicate the preponderance, but not the exclusive application, of the study of pathology to problems of insanity. The plan in establishing the pathological institute was practically not to restrict its studies along any one exclusive line of science, but to make such investigation broad and comprehensive by the union of all those branches of science which can be practically brought to bear upon the scientific study of mental disease. The great renaissance in our knowledge of the normal nervous system accomplished by the method of Golgi and his followers, the great progress in the science of the cell structure, the progress of bacteriology, linked with physiological chemistry, the comprehension of the correlation of the nervous system with other portions of the body, the tendency to correlate all of these sciences so that they might be focussed upon the problems of the physical basis of insanity, made the time ripe for establishing a central department for the scientific work of the State Hospitals, not as an experiment, but on a permanent basis, and one which would justify the expenditure of the considerable moneys which such an undertaking to be successful, necessarily requires. As already intimated, such a conception of investigating the nervous system as a dependent part of the body in the broad light of the operation of the general laws of pathological processes and by co-ordinating pathological histology with its sister sciences was a distinct departure from the plans of working at these problems in the past.

Furthermore, it was deemed wise, both from an economical and a scientific standpoint, to centralize the research work of the hospitals in a single institution, in order that unity of method in investigations might prevail and proper guidance and systematizing of the work by a master hand might be in order.

In its eighth annual report to the Legislature (1897) the Commission, referring to the Institute said:—

"The future progress of work of this kind, then, may be believed to justify much expectation in the investigation of the most

subtle and difficult field of the causation of disease, namely, the morbid condition of the nervous system, which gives rise to and underlies the manifestations of insanity, and it is believed the people of the State will not fail to sanction the making of necessary expenditure for carrying on this most important work for which the time has only so recently been adequate. It is not too much to hope that in the comparatively near future such investigations will exhibit practical results both in the prevention and cure of insanity."

The Institute is divided into departments and the gentlemen in charge of these departments are designated associates in their respective branches, the whole being under a Director, distinguished for his scientific attainments, Dr. Adolf Meyer.

29. A codification of the laws of the State relative to the insane into one comprehensive statute, known as the "Insanity Law," thus bringing the hospitals into unison, under one charter, and placing them all on an equal footing in the matter of organization, administration and finances.

Respecting what has been accomplished in the direction of improvements to the hospitals, as well as in the promotion of the welfare and comfort of their inmates, as a direct result of the adoption of the policy of State care, a perusal of the annual reports of these institutions would show that their condition as regards structural improvements and equipments, sanitary condition, order and cleanliness, fire protection, furniture, clothing, food supplies, industrial and other occupations, means of diversion and amusements, discipline, nursing, medical service and organization, has been steadily progressive and that the standard of care is in all respects much higher than it was prior to the enactment of the State Care Law, while at the same time the cost of maintaining the hospitals has been greatly diminshed. Prior to October 1, 1893, at which time the Commission was given supervision and control of the hospital finances, the average annual per capita cost for maintenance was $222. The Commission reduced this to $184, at the same time materially raising the standard of care, thus effecting, in a single year, a saving of hundreds of thousands of dollars.

It is the will of the people of the State of New York, that its hospital system shall be conducted on a plan that will afford every opportunity of recovery to recoverable cases and at the same time insure proper care and treatment to the chronic insane, to the end that their condition may be improved as far as possible and that the most hopeless of these unfortunates may have the

chance of possible recovery, under the best conditions and environments with which they can be surrounded. In other words, the people of this great commonwealth desire that in their standard of care and in their results their hospitals for the insane shall stand second to none in the world, and I believe they are abundantly able and willing to supply the necessary means to secure these conditions and results.

The progress and present status of the New York State hospital system, which I have endeavored to portray, may be regarded as a continuation, if not the full fruition, of the great reform movement in behalf of the insane, inaugurated more than a century ago, by Pinel in France, by Tuke in England, by Jacobi in Germany and by Rush in the United States.

This splendid system, begun in 1836 and consummated in 1890, representing a growth of more than half a century, is a living monument to unselfish effort for humanity and science. Its existence to-day marks a great and lasting triumph of philanthropy and humanity over ignorance and greed, in the march of civilization.

All honor to the Medical Society of the State of New York, which, through its humane secretary, Dr. Willard, blazed the pathway of this great reform through a wilderness of ignorance and greed. All honor to those good men and women who later renewed the struggle, against fearful odds, and courageously bore the burden of conflict for the emancipation of these mentally afflicted fellow-beings to a successful issue. They may well be pardoned feeling an exultation and a sense of triumph.

It is not claimed that the new system is, unlike other human agencies, without imperfections. It is claimed, however, that its already demonstrable advantages over the system which it superseded are so great as to convince even the most sceptical of its former opponents of its superiority, both in its humane and its financial aspects; also that the principle of State care founded on the broad basis of science and humanity, when intelligently applied, as it is in the State of New York to-day, stands for all that is best in our present knowledge of the care and treatment of the insane.

A NEW METHOD OF PRESERVING THE CENTRAL NERVOUS SYSTEM FOR MORPHOLOGIC STUDY.

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The methods used for preserving the central nervous system *in toto* are unsatisfactory for the purpose of morphologic study of the brain, the defect being especially noticeable when one wishes to study the cerebral convolutions. The solutions in general use harden the brain substance after a short time, and this makes it difficult to handle and to follow out the course of the convolutions —in their normal or abnormal curves and the plicæ internæ. Today it is quite important to be enabled to follow out the course of the convolutions; especially so since S. Sergi has pointed out the existence of *internal accessory fissures* that are seen on the anterior surface of the posterior central convolution in the *Hylobates Syndactilus;* similar fissures were afterward found by me in many brains of the insane. I then undertook the task of finding a fluid that would preserve the cerebral substance without hardening it. Chloral hydrate has long since been used in microscopic technique: by Moeller—in botany; by Overton, Zimmermann, Schimper Lenze and others; Rolles Lee and Henneguy especially recommend chloral in solutions of from 2 per cent. to 5 per cent. for macerating substances for study. Lewandowsky used chloral solutions for the study of the salivary glands, and Hickson for the study of the retina of the arthropodous. Ioetinger, Verworon and Kueckenthal found chloral hydrate as an ex-

cellent fixative in the study of the bryozoa, the Mullusca and the annulose; chloral hydrate has been used with Hoyer's and Kultschitzky's carmine solutions, with VanWijke's ammonia-picrocarmine and Gage's hematoxylin, etc.

Butzke has used aqueous solutions of chloral hydrate (1:1 to 1:10) for the study of the nervous cells of the central nervous system. And I have been enabled to convince myself of the correctness of his claim that a combination of chloral and hyperosmic acid (¼ per cent.) is excellent for isolating the cellular elements.

I do not find, however, that chloral hydrate has been used for the purpose I indicate in this paper. My method is as follows: as soon as the brain is taken out of the cranium it is stripped of the meninges and preferably cut into its two hemispheres along the interhemispheric fissure; it is then put into an aqueous solution of chloral hydrate of from 10 per cent. to 15 per cent. This solution is changed six hours later, then twenty-four hours later; then again twenty-four hours later; then it may be changed twice every three days, and then every eight days until the solution remains absolutely clear and transparent. In order to obtain the proper consistency of the brain substance it is necessary to change the fluid as soon as it becomes cloudy.

The chloral solution renders the brain substance bloodless; hence the solution is deep red and rose colored after the first six and the first twenty-four hours; if the fluid is not changed, the brain becomes rose colored.

The brain substance thus treated is well preserved while retaining the consistency it had at the time of the autopsy. The convolutions may be pulled apart without tearing them; they present neither increase nor decrease of volume; their surface presents all the particulars seen at the time of the autopsy and the convolutions retain their normal reciprocal positions. The *insula* can thus be examined in its normal position—by pushing aside its limiting convolutions. The study of the calcarine fissure is also made convenient (Zuckerkandl) without necessitating the cutting away of parts of the neighboring convolutions. The cerebellar hemispheres also retain their normal form: not only is it possible to handle the individual cerebellar convolutions, but also the single layers accompanying each lobe can be studied with accuracy.

When properly treated with chloral hydrate the spinal cord presents facilities for the study of the anterior and posterior horns and their relation with the ganglia.

For the study of the brain I cut it preferably into its two hemi-

spheres before plunging it into the chloral solution; this facilitates the contact of the inner surface of each hemisphere and of the ventricles with the solution, and the convolutions in this region become of proper consistency for study.

In order to obtain good results the following conditions are necessary:

1. Each cerebral hemisphere should be plunged into not less than two litres of a 10 per cent. solution of chloral hydrate.

2. The pia mater should be torn off before the hemispheres are put into the fluid—or immediately afterward. This operation requires patience and is easiest executed by tearing off the membrane while the brain is in the solution. To avoid abrasions of the brain substance, the pia mater should be torn off not later than after the first two hours following the autopsy.

3. To avoid artificial deformation of the brain surface absorbent cotton should be put at the bottom of the vessel destined to hold the brain.

4. The fluid should be changed after the first six hours, then after the first twenty-four hours—twice in succession; then—after three days—twice, and finally after every eight days.

As a general rule, the fluid should be changed as soon as it becomes cloudy. In my experience the fluid becomes clear after it has been changed some eight or ten times.

If it is desired to give the brain some firm consistency for the purpose of morphologic study of the convolutions and sulci it can be done by adding to the chloral solution used for the first few times a few cubic centimeters of a 10 per cent. solution of formol. Any desired consistency of the brain may be obtained by successive addition of a few c.c. of formol solution to the chloral solution when the latter is changed.

The following is a good formula for the solution to be used for one hemisphere:

Chloral hydrate	200 grams
Distilled water	2 litres
Formol (10 per cent. sol.).....	100 cubic centimeters.

This solution should be changed as indicated above. After twenty days I have used a 10 per cent. solution of chloral without formol.

I have specimens of brains obtained six months ago and treated with this method that present a normal consistency. I have obtained the same results with this method—regardless of the time of the year or the temperature in the room when it was used. I have specimens of brains taken from adult rabbits that present

the same freshness of consistency as they did on the day of the autopsy.

I have tried to determine whether the brain weight underwent any change after the organ had been treated for thirty days with a 10 per cent. sol. of chloral hydrate. I did not study this question as regards longer periods because this time suffices for all purposes of morphologic study.

The brain increases in weight from 6 per cent. to 7 per cent. after thirty days' treatment with a 10 per cent. solution of chloral —changed as indicated above. This is a greater increase in weight than is obtained when treated with a 10 per cent. solution of formol during the same period, the latter solutions causing only a 3 per cent. increase in weight, as is indicated by Flatou. When treated with a bichromate solution (2.5 per cent.) the increase of weight is 32 per cent. (Donaldson). The brain weight decreases when treated with alcohol (30 per cent. decrease of weight after thirty days' treatment with alcohol at 96 degrees).

The chloral method of preserving brains also has the advantage of being free from evaporations that are irritating to those who handle the specimens, as is the case with the alcohol and formol method; chloral is also convenient because it does not stain the hands and objects that come in contact with it—as is the case with bichromate and formol solutions. Another advantage is that after subjection to this method the brain may be treated with any other method. The brain thus treated is also convenient for class demonstration.

Rome, Italy, October 1, 1907.

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PERIPHERAL AMYOTROPHY DUE TO NERVE TRAUMATISM. CLINICAL AND ANATOMOPATHOLOGIC STUDY.

By Dr. R. Bonfigli, *Senior Physician, Manicomio, Rome, Italy.*

(From the Anatomopathologic Laboratory, Dir. Prof. A. Giannelli, Rome, Italy.)

The genesis of muscular atrophy following traumatism of peripheral nerves is as yet not well known. Toward the end of the XVIIIth century the cause of muscular atrophy was attributed to ascending neuritis, but to-day this view is not accepted; the etiology seems rather complicated from the clinical and anatompathologic study of the disease.

The case below cited is one of amyatrophy following traumatism to a peripheral nerve. The anatomopathology of the case is also given.

The patient, P. R. E., a woman, 45 years old, was admitted to the Hospital for the Insane, Rome, Italy, October 24, 1905. Her first admission to the hospital was December 13, 1878. Her disease was then diagnosed as mania, and she was discharged as cured three years later. Her parents are illiterate and she is in a stupid condition, so that her history cannot be had in detail. A few years before her second admission to the hospital she received a blow on the left shin bone. It is not quite clear whether

the traumatism was inflicted with a stick or whether she had been bitten by a dog. The patient states that the wounds suppurated, and cicatrices remain as traces of the traumatism. A few months before her last admission to the hospital she suddenly became violent, refused to eat, walked out naked into the street and assaulted those who tried to interfere with her.

Objective Examination.—The skull is normal and has the following diameters: antero-posterior—180 centimeters; transverse—145 cts.; longitudinal curve—315 cts.; transverse curve—285 cts.; maximum horizontal circumference—530 cts.; anterior hemicircumference—285 cts.

Bony frame well developed, but the patient is emaciated. Murmur at the cardiac apex, replacing in part the first sound and continuing after it. Muscles flabby. The lower left limb is reduced in volume as compared with the right one; measured at the middle line, the left leg has a circumference of 183 millimeters, while the corresponding circumference of the right leg is 212 millimetres. The circumference of the middle of the left thigh is 240 mm.; that of the right one—270 mm. The muscular atrophy of the left thigh is uniform.

Impossible to examine the sensibility because the patient is excited. There are no signs of focal lesions. The pupils react to light; knee reflexes good; plantar and pharyngeal reflexes good; the sensory organs seem to be normal.

Psychic state.—Attention is now normal, now distracted, the rapid change seeming to be caused by sensory disturbances and hallucinations; memory of time good, but inaccuracies are due to delusions and hallucinations. The patient is in a condition of continuous motion, now rhythmic, now automatic; delusions and hallucinations seem to be of mystic nature: devils try to insult her and enter her body; in defense—she makes the sign of the cross all over her body and strikes those who approach her. At other times she sees saints and angels who protect her and she holds out her hands to them, apparently in prayer.

This condition of agitation continued for two months, during which the patient became emaciated and exhausted. She died January 1, 1906.

Autopsy.—24 hours after death. Cranial bones of normal thickness. Dura mater adherent to the calvarium; pia mater—vessels injected, edematous, glistening, easily detached from convolutions. Basal ganglia and medulla oblongata of normal aspect; spinal meninges considerably thickened; white and gray cerebral substance and nerves of normal aspect. Thoracic and

abdominal organs normal. Muscles of the atrophied limb somewhat paler than the others.

Spinal cord put into alcohol—96 degrees and into Mueller's fluid for examination of the cells and nervous fibres. The cells of the spinal cord were studied with Nissl's method and toluidin blue; and the nervous fibres—with the Kulschitzky-Wolters stain; the muscles—were treated with the van Gieson-Weigert method.

Pathologic Anatomy.—Spinal cord-cervical region: under low power (objective 4, ocular 4): pia mater considerably thickened and the injected vessels present an obstructed lumen. Large connective tissue bands run from the pia mater into the white matter along tortuous blood-vessels. The white and gray matter present no alterations. Under high power (objective—homogeneous immersion—1/15, ocular—4): the pia mater and the connective tissue bands springing therefrom are rich in small round or oval cells, deeply stained, granular in appearance, some being more deeply stained than the rest. Many such cells are seen around or within the vascular walls. Most probably these cells are leucocytes.

The endothelial and muscle cells of the thickened vascular walls are numerous; the vascular lumen is narrowed and filled with blood corpuscles among which are seen numerous mono- and polynuclear leucocytes. In some places the clots are made up entirely of leucocytes. The vessels are tortuous and the perivascular spaces are large. The glia seems to be normal and its nuclei do not seem to be increased in number or volume.

The groups of nervous cells in the gray matter seem to be normal on both sides; the cells of the anterior horns are perhaps smaller than normal, but their nuclei are round, well defined, colorless and the nucleoli are also well defined; the Nissl bodies are well stained and the prolongations are long and straight.

The fusiform cells of the posterior horns, those of the gelatinous substance of Rolando and the columns of Clarke seem to be normal. Similar conditions are presented in the dorsal region.

In the lumbar region the alterations are more characteristic; under low power: there is a marked difference between the cells of the right and left anterior horns: on the right side the cells are normal in structure and number, while on the left side they are markedly decreased in size and are rarified. The pia mater is thickened, rich in blood vessels and large bands of connective tissue part from it and reach into the white matter. Under high power: leucocyte infiltration around the vessels, that are filled with blood clots and their walls are thickened. Numerous pigment granulations are seen within the vascular walls and in the

surrounding connective tissue. The vessels do not seem to be altered in the white and gray matter, except that their walls are somewhat thickened and some of the vessels are filled with blood; but around them there is no lymphocyte infiltration or pigment granulation to any extent. The most marked alterations in this region are those of the nervous cells of the anterior horn. On the right side the cells are normal (see fig. No. 1). They are large, with a large, colorless, well defined nucleous, the nucleolus being placed in the middle and deeply stained; the Nissl bodies are well defined and deeply stained about the nucleus, and paler at the periphery. The prolongations are long and straight. These cells appear in well defined groups, occupying mostly the antero-external region of the anterior horn. On the left side the cells of the anterior horn are markedly altered (see fig. No. 2). They are considerably reduced in volume; their nucleus is not well defined, slightly stained, the Nissl bodies are ill defined and ill grouped, most of them appearing as a finely granulated amorphous substance. Some of the cells are less markedly altered, but their volume is subnormal as compared with those on the right side. The greatest alterations are found in the middle latero-ventral and latero-dorsal groups of cells of the anterior horn. In Clarke's column the cells are only slightly altered, if at all; those of the posterior horn do not show any alteration. The glia appears slightly increased, especially in the peripheral part of the cord; its nuclei are numerous.

Transverse and longitudinal sections of the muscles show marked proliferations of the sarcolema nuclei; the fibres are wasted, transparent and divided one from the other by connective tissue bands; and the tracts of muscular fibres are also surrounded by bands of connective tissue rich in vessels that are slightly altered. The transverse and longitudinal structure of the fibres are normal.

The peripheral nerves that had sustained the traumatism present marked thickening of the perineurium but no other alterations. The other peripheral nerves are normal.

Summary.—The peripheral traumatic wounds of the lower left limb were followed by infection and suppuration that had finally healed. Uniform muscular atrophy involving equally all the muscles of this limb followed the suppuration. The circumference of the left thigh and leg was reduced three centimetres as compared with that of the right side. The atrophy was exceptionally severe; according to Sicard (1), the evolution of ascending traumatic neuritis is not necessarily progressive and is arrested in its course in most cases; but only severe traumatisms are fol-

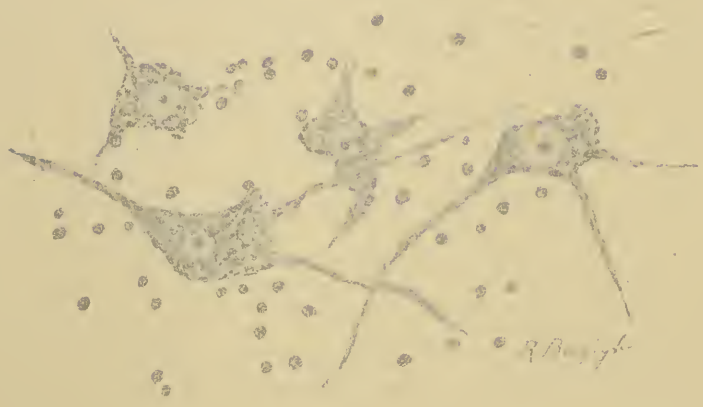

FIG. 1.

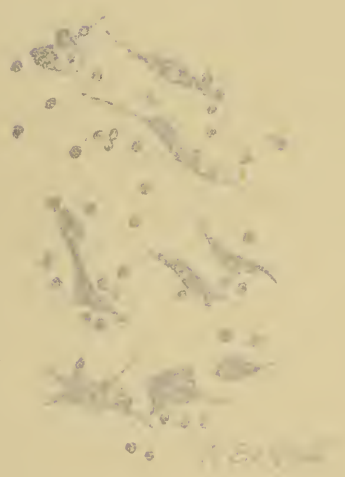

FIG. 2.

lowed by ascending degeneration (2). Another fact worthy of note in my case is the exaggeration of the reflexes. In most cases of this kind the tendon reflexes remain normal, but sometimes they are exaggerated and rarely abolished (3).

In Angiolella's case there was exaggeration of the reflexes of the lower limb. The author explains this by the probability of interfered cerebral inhibitory action or else—exaggerated excitability of the spinal cells (4).

The autopsy showed traces of meningeal inflammation and the microscopic findings showed similar alterations. The pia mater was thickened, rich in blood vessels filled with clots of red and white blood corpuscles; this points to a progressive inflammatory process. This process of meningeal irritation, which according to Pierre Marie and Leri (5) suffices to explain the frequent degeneration of the posterior columns in cases of muscular atrophy caused by traumatism of the peripheral nerves, may be explained by an ascending course of the infection along the nerves involved; this mechanism explains the alteration of the spinal ganglia consequent to involvement of the peripheral nerves, while the nerves sustaining the traumatism are rarely altered themselves.

According to Pierre Marie and Leri, muscular atrophy of the regions not supplied by the injured nerves is caused by degeneration of the spinal ganglia cells of the anterior horns—subsequent to a diffuse meningeal process. Esposito has pointed on the migratory tendency of traumatic atrophy and he considers this migratory tendency as a pathognomonic sign of traumatic amyotrophy. But this atrophy should not be ascribed exclusively to a diffuse meningeal inflammation. Among other pathogenic factors mentioned are: *réaction à distance,* retrograde degeneration of Durante, indirect Wallerian degeneration of vanGehuchten, perineural processes due to local infection of the wound, sympathetic action of the spinal cellular groups, etc.; finally, tertial atrophy of the collateral fibres of the long and short tracts of Mingazzini has been pointed out as a cause of post-traumatic amyotrophy (6).

The most marked microscopic alterations found in my case were in the pia mater and the cellular groups of the lumbar region of the spinal cord on the side where the traumatism had been inflicted; in the cervical region of the cord the lesions were on both sides. These conditions point to the facility with which an infectious process may extend from the periphery of a nerve into the depth of the spinal cord, while the nerve itself is not deeply affected: in my case the central nervous branch involved in the traumatism presented only slight alterations while the

destructive process in the corresponding ganglia was marked. This fact demonstrates once more that post-traumatic amyotrophy of combined nature, as pointed out by Esposito, has for its cause besides the ascending degeneration of the wounded nerve,—Duchenne's sympathetic degeneration of the spinal groups of cells and, to the greatest extent,—the inflammatory process of the spinal meninges consecutive to the peripheral nerve traumatism.

Rome, June, 1907.

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6. Esposito, *l.c.*

A CASE OF KORSAKOFF'S PSYCHOSIS DUE TO AN UNUSUAL CAUSE.

By Dr. Serge Soukhanoff, *Privat-Docent, University of Moscow.*

The patient (*), S. V. M., a woman, 21 years of age, has been married 8 months. Last menstruation—latter end of September, 1905. Since October 14 of that year—frequent vomiting difficult to control, coinciding with a beginning pregnancy. The vomiting exhausted the patient, and she was taken to a private hospital for treatment, where she soon improved. She remained in bed on account of physical weakness and a febrile condition, her temperature rising to from 37.1 to 37.7; her pulse ranged from 100 to 120 per minute—out of proportion to the temperature. Toward the end of December her lower limbs became weak so that she

* I saw the patient in consultation with Dr. F. A. Alexandroff.

could not support the weight of her body. In the beginning of January she showed mental disturbance for the first time and impairment of her memory was most noticeable. She recognized those about her, but often remarked that she had seen people whom in reality she could not have seen in the hospital. The knee reflexes disappeared soon after her mental disturbance had been noticed and pressure on the nerves of the limbs was painful. At one time she saw objects double.

She remained in bed in a weak condition; muscular action of the hands weak and marked by slight incoordination; contracture of the left leg that remains flexed at the knee joint; marked pain when attempt is made to straighten this limb; the right leg is held in extension and the patient cannot lift it up. Absence of the knee reflexes. The muscles of the calf of the leg are wasted, flabby and weak; the muscles of the pelvis are also flabby; those of the upper extremities are affected to a lesser extent. Speech somewhat impaired; function of the facial muscles—somewhat impaired; the slightest pressure on the muscles of the lower extremities on both sides causes the patient to cry out with pain. No particular pain on pressure of the upper extremities. The pain in the muscles makes it impossible to investigate the reaction to pain of the sciatic nerve.

The patient is talkative and childish and often asks at random for more food. She often remarks that there is "Something wrong in her head" and complains of weakness in her legs; memory impaired as regards events since the onset of her illness; recalls with difficulty the name of the present month or the name of the month when she became ill. When asked whom she has seen to-day, she assures me having seen persons whom she could not possibly have seen; she tells a story of having met me before, when in reality this is the first time she has seen me. When corrected on this score, she does not feel offended and agrees with me that she is making a mistake. Conversation fatigues her. Her pulse is 120 per minute, but this does not affect her good humor.

This case is undoubtedly one of Korsakoff's psychosis. Signs of polyneuritis are marked; there is absence of the knee reflexes; muscular pain on pressure; marked weakness of the legs that is almost paralytic; impaired muscular strength in the upper extremities; rapid pulse (affection of the pneumogastric nerve), etc. Alongside with these disturbances the patient presents peculiar psychic disturbances: she is good-natured, her memory is impaired as regards recent events and she imagines having seen people many times, whom in reality she could not have seen.

These physical and psychic signs are expressive of Korsakoff's psychosis.

The conditions in which this case of Korsakoff's psychosis developed are interesting: persistent vomiting set in early in her pregnancy; Korsakoff's psychosis is also generally characterized by vomiting early in the disease. But in this case it is difficult to specify exactly at what time Korsakoff's psychosis set in. Persistent vomiting is considered by some as being due to autointoxication; Korsakoff's psychosis is also an expression of autointoxication. It is difficult to say whether or not the psychic trouble in this case was the result of autointoxication with polyneuritis and whether or not the severe form of vomiting resulted from another infection. I am inclined to think that Korsakoff's psychosis and the vomiting had each its particular form of autointoxication. The rise of the subfebrile temperature to 37.7 degrees C. points to some form of autointoxication. But alongside with this condition, the urine contained albumen, sugar and hyaline casts—which points to renal infection; and which together with the other unfavorable organic conditions caused the onset of Korsakoff's psychosis. Gynecologic examination was negative as regards the genital organs.

The question presents itself whether or not there is an analogy between Korsakoff's psychosis caused by hepatic trouble (jaundice) and the psychosis here described—due to renal trouble. In this case it is difficult to see the exact nature of the psychosis because the patient's general exhaustion was due to the severe vomiting; although the renal trouble must have been the main cause of the autointoxication that brought on Korsakoff's psychosis; the other factors in the autointoxication due to the pregnancy should not be excluded from the causation of the disease.

Among the many signs of the disease in this case may be mentioned retinal hemorrhages in both eyes, which must have taken place during the onset of Korsakoff's psychosis—when the pulse was already rapid. These hemorrhages point to alteration of the muscular walls that is probably due to autointoxication. As is known, cerebral hemorrhages of various forms are frequent during the course of Korsakoff's psychosis. It is probable, therefore, that the retinal hemorrhage in this case was simply one of the symptoms of cerebral hemorrhage that often precede Korsakoff's psychosis.

METHODS OF RESUSCITATING ELECTROCUTED ANIMALS. DIFFERENT EFFECTS OF VARIOUS ELECTRIC CURRENTS ACCORDING TO THE METHOD USED. IMPORTANCE OF EXCLUDING FROM THE CIRCUIT THE CENTRAL NERVOUS SYSTEM DURING RESUSCITATION.*

SECOND PRELIMINARY COMMUNICATION.

By Louise G. Robinovitch, B. *ès L., M.D., Paris, Member, New York Academy of Medicine; Member, American Medical Association; Foreign Associate Member, Medico-Psychological Society, Paris.*

The researches presented in this communication were made according to two distinct methods. In the old method of resuscitation the cathode was fixed at the head during the rhythmic excitations. In the new method I exclude the head from the electric circuit, by shifting the cathode to the back of the chest.

In my first preliminary communication, entitled, "Resuscitation of Electrocuted Animals. Choice of the Electric Current and Method Used. Application to Human Beings. Experimental

* Abstract and tracings of the blood pressure and respiration presented at the Congress of French Alienists and Neurologists, held at Geneva, Switzerland, August 1-7, 1907.

Abstract, tracings of the blood pressure and respiration and part of the experiment presented at the International Congress of Psychiatry, Neurology and Psychology, held at Amsterdam, Holland, September 2-7, 1907.

Abstract and tracings of the blood pressure and respiration presented at the International Congress of Hygiene and Demography, held at Berlin, Germany, September 23-29, 1907.

Part of the experiment presented by invitation at the Moabit Krankenhaus and at the Rudolf Virchow Krankenhaus, September-October, 1907. Tracings of the blood pressure and respiration also presented.

Study of the Respiration and Blood Pressure during Electrocution and Resuscitation," published in The Journal of Mental Pathology, Vol. VIII., No. 2, 1907, I stated that the effects obtained in my experiments with the induction current for the purpose of resuscitating electrocuted animals—according to the old method indicated in that paper—did not warrant the use of this current; that a current of low tension and moderate interruptions was preferable for this purpose. In my experiments that followed I have tried to study three particular points regarding the method of resuscitating electrocuted animals; this study may be grouped under three different headings as follows below:

I.—The comparative value of the electric current chosen for the purpose of resuscitation.

II.—The comparative effects of various electric currents when used on dogs and on other animals respectively.

III.—The value of exclusion of the animal's head from the circuit when practicing the rhythmic excitations for the purpose of resuscitation.

I.—Comparative Value of the Electric Current Used in Relation to the Old Technique Employed in My Experiments. The old technique used in my experiments is described in my Paris thesis "Sommeil électrique, épilepsie électrique and électrocution," as well as in my paper cited above: the cathode is fixed at the head and the anode at the lower end of the spine. The experiment is performed on a rabbit; the animal is subjected to an electric current of 14 volts (current of low tension and moderate interruptions) during a period of from 30 seconds to two minutes—until the blood pressure in the carotid artery and the respiration are no longer registered, and the animal is in a condition of apparent death. I stated that it was possible to resuscitate a rabbit in this condition by means of rhythmic excitations with the same current that had caused death—the electrodes remaining in their original positions.

The rhythmic excitations are produced by means of a small mercury interrupter during one second and at intervals of from two to three seconds—according to the gravity of the electric shock and especially according to the energy of respiratory reaction of the animal.

It is comparatively easy to resuscitate a rabbit electrocuted with the Leduc current—by using rhythmic excitations of the same current. But resuscitation is quite difficult or impossible when the animal is electrocuted with a continuous or an induction current.

The results obtained from the use of the various currents are formulated below.

1. The effect of the Leduc current in a lethal potential is far less dangerous to the respiratory and cardiac centres than is that of the continuous or of the induction current.

2. In a series of electrocutions caused by the continuous current, passing through the body during a period of one minute, more or less, I did not succeed in resuscitating the animals by means of rhythmic excitations caused by the same potential of the same current. And the few exceptional animals that were thus resuscitated died a few hours after the experiment.

3. The continuous current of lethal potential paralyzes the heart definitely and should not be used for rhythmic excitations for the purpose of resuscitating animals electrocuted with the same current.

4. The induction current of lethal potential, when passing through an animal's body from thirty seconds to one minute is also a cardiac paralyzer. In a series of electrocutions caused with this current (for a rabbit-Dubois-Raymond's apparatus running on 8 volts of accumulators, coil No. 2, placed at 5.5 centimeters of the scale) I did not succeed in resuscitating animals by means of rhythmic excitations with the lethal current. And the exceptional animals that were thus resuscitated died a few hours after the experiment.

5. The induction current seems to kill the animal by paralysis of the respiratory centers—in the first place—if one is to judge the matter by the respiratory tracings and the blood pressure in the carotid artery (some of these tracings are published in my papers cited above, and the others I present to you for inspection); cardiac paralysis follows rapidly.

6. During the passage of the lethal induction current the respiratory muscles seem to be particularly affected by tetanic convulsions; these muscular convulsions are so marked that the registering drum makes a noise that is heard at a distance.

7. As I found it difficult to resuscitate animals electrocuted with a continuous or with an induction current, by applying rhythmic excitations of the corresponding currents, I tried to resuscitate the animals electrocuted with these currents by using the Leduc current for the rhythmic excitations.

8. Using the Leduc current for the rhythmic excitations, I succeeded in many cases to resuscitate animals electrocuted with the direct or the induction current.

9. It is self-evident that when the heart and respiratory centres are definitely paralyzed with the lethal currents used, even

the preferred current will not resuscitate an electrocuted animal. But when an animal is brought into a condition of apparent death by means of the continuous or the induction current, and there remains the slightest chance of resuscitation, the latter may be accomplished by practicing rhythmic excitations with the Leduc current; similar excitations practiced either with the induction or the continuous current will only help to kill the animal, as may be judged from the tracings which I have the honor of presenting to you to-day.

10. In cases of accidental electrocution with the alternating or the continuous current, rhythmic excitations with the Leduc current should be used for purposes of resuscitation.

11. My excellent colleague, Professor Battelli, of Geneva, criticized this method at the Congress of French Alienists and Neurologists, held at Geneva, Switzerland, August 1-7, 1907, saying that the procedure would be useless in accidental electrocution in man, because death was instantaneous in such cases. It should be remembered, however, that in accidental electrocution of man death is not always instantaneous; on the contrary, observation shows that the majority of such subjects continue to breathe for some time, breathing being suspended after the physician has administered some ineffectual remedy—such as "smelling salts" or similar agents. It should be borne in mind that such subjects suffer from paresis of the respiratory and cardiac centres; as soon as the patient stops breathing, artificial respiration by means of rhythmic excitations should be practiced—until the patient resumes his spontaneous respiration. Besides causing maximum chest expansions these excitations also cause cardiac contractions to take place.

II.—Experiments on Dogs. Old Technique—the Animal's Head Remaining in the Circuit During the Rhythmic Excitations.—The dog's heart and respiratory centres are highly sensitive to electric currents; and when using the old technique for purposes of resuscitation it is difficult or impossible to revive a dog subjected even to a minimum potential that causes apparent death to take place. Even the Leduc current used for the rhythmic excitations fails to bring back to life such dogs—if the old technique is used for the rhythmic excitations. It is well to recall that the old technique consists of using the lethal potential for the rhythmic excitations, the electrodes remaining in their usual places: the cathode at the head and the anode at the lower part of the spine.

I lost a whole series of dogs which I tried to revive according to the old technique. The condition of the dog when I try to

revive it is generally as follows: Spontaneous respiration is abolished, the blood pressure in the carotid artery has fallen to from four to six centimeters of mercury (simple manometer of François-Franck) and the animal remains in a condition of apparent death.

Voltage Necessary to Resuscitate Dogs in a Condition of Apparent Death Caused by Electric Shock—Using the Old Technique.—As I lost every dog which I tried to revive with rhythmic excitations of the lethal potential, I reduced the potential: instead of 80 to 110 volts, I used 5 to 10 volts of the Leduc current. This change of voltage enabled me to save many dogs in a condition of apparent death from electric shock, but still a large number of these animals succumbed regardless of the rhythmic excitations practiced with a small voltage.

III.—Exclusion of the Animal's Head From the Circuit When Practicing the Rhythmic Excitations for the Purpose of Resuscitation.—My new technique consists of an important change of the position of the cathode; instead of remaining at the head—as was the case in my previous experiments, the head is excluded from the electric circuit during the rhythmic excitations, and the cathode is placed at the back of the chest. I changed the position of the cathode in order to exclude from the circuit the bulbar cardiac and respiratory centres. With the cathode at the back of the chest and the anode at the end of the spine—the great respiratory muscles are all in the circuit during the rhythmic excitations. The reasons that led me to make this change in the position of the electrodes were as follows below:

1. The fatal effect of rhythmic excitations (caused by electric currents of lethal potential) on the respiratory and cardiac centres of dogs in a condition of apparent death, due to an electric shock.

2. In July, 1907, while studying the state of the brain during electric epilepsy I observed that the brain substance became markedly paler than normal during the four seconds of the passage of the epileptogenic electric current (see my paper on the "General and Cerebral Blood Pressure in Electric Epilepsy," Journal of Mental Pathology, Vol. VIII, No. 3, 1907). There was every reason to believe, therefore, that while practicing the rhythmic excitations for the purpose of resuscitation I also caused momentary anemia of the central nervous system in general and of the central cardiac and respiratory centres in particular. It was self-evident that this anemia—repeated with each rhythmic excitation—was undesirable: contraction of the blood vessels was a detriment when the animal's heart was at the

point of paralysis—the carotid blood pressure registered being from 4 to 5 centimeters (simple manometer of François-Franck).

3. Production of artificial respiration and cardiac beats by means of rhythmic excitations could be useful on condition that the central respiratory and cardiac centres be excluded from the electric circuit and free from repeated asphyxia caused by each rhythmic shock.

Respiratory and Cardiac Reaction in Relation to the New Technique—the Head Being Excluded from the Circuit. Higher Voltage Required for the Production of Ample Respirations.—In order to practice artificial respiration according to my new technique I proceed as follows below:

The animal's fur is closely cut in three places—corresponding to three parts of the body where the electrodes should be applied: at the head, at the back of the chest and at the lower part of the spine. The electrode at the head measures about 10 x 10 centimeters, and the other two electrodes measure each about 11 x 18 centimeters. Each of the larger electrodes is put upon the Claude-Bernard cradle—in positions corresponding to the shaven parts on the animal's back; and when the dog is put into the cradle, the respective electrodes are pressed closely around the corresponding parts of its body. When the head and paws are tied to the cradle, the head electrode is fixed by means of two rubber rings.

The electrode at the lower part of the spine is always the anode; the electrode at the head is the cathode for the time being. The animal is now subjected to electric anesthesia (see my paper on "Electric Anesthesia. Its Use in Laboratory Work," Journal of Mental Pathology, Vol. VIII, No. 3, 1907). The carotid artery is exposed and connected with the manometer. A lethal current is now sent through the dog's body and is kept up until apparent death sets in: absence of spontaneous respiration, the carotid blood pressure registering between 4 and 6 centimeters of mercury. An assistant quickly frees the head, drops the head cathode, substitutes the wire of the chest electrode in the small mercury interrupter (the chest electrode is now the cathode), frees the forepaws, seizes the tip of the tongue with a pair of surgical clamps, cleanses the mouth of all mucus and maintains the dog's mouth wide open—by lifting the lower jaw by its fur and keeping the tongue close to this jaw.

Meanwhile, the operator is practicing rhythmic excitations with a sufficient potential to cause maximum respiratory expansions. The rhythmic excitations are practiced for one second and at intervals of from two to three seconds—according to the

gravity of the lethal shock and particularly according to the respiratory reaction.

In favorable cases the expiratory movements that follow the chest expansions are so forceful that they cause a noise that is heard at a distance in the laboratory. From ten to thirty rhythmic excitations are generally necessary to restore spontaneous respiration. But in some cases, that seem hopeless, I have often witnessed the appearance of spontaneous respiration after a lapse of from two to three minutes—during which the rhythmic excitations have been kept up.

When the proper voltage is used and the respiratory reaction is sufficient, the following conditions prevail: the chest expands to its maximum capacity with each rhythmic excitation; the tongue that was flabby and fell to the roof of the mouth (the animal is on its back) assumes marked tonicity and is projected forward along the floor of the mouth; the diaphragm pushes before it all the visceral organs; the forepaws project upward (the animal is on its back) with great force, and the great mass of respiratory muscles included in the circuit enters into play with great vigor. The heart also responds to every rhythmic excitation.

A greater voltage is needed when the cathode is at the chest than when it is at the head. When it is at the chest I generally use from 20 to 40 volts or more of the Leduc current. When the induction current is used (Dubois-Raymond apparatus, coil No. 2) I shift the coil along the scale until a sufficient potential is obtained, causing ample respiratory reaction; the coil may have to be placed between 5 and *o* centimeters of the scale. The operator should judge after the first respiratory reaction whether or not the potential is sufficient; he should increase or decrease the voltage according to requirements—by turning the handle of the reducer of potential or by shifting the position of the coil—according to the current used for the rhythmic excitations.

I also wish to point out the fact that artificial respiration caused by rhythmic excitations with electric currents is superior to all other forms of artificial respiration known to us to-day.

The operator should bear in mind an important detail connected with this process of resuscitation: he should watch carefully for the appearance of the first spontaneous respiration and should stop the rhythmic excitations as soon as he notices the slightest spontaneous respiration. Death is often caused by the encroachment of an artificial respiration on a spontaneous respiration.

But if the animal stops breathing spontaneously, the operator should quickly resume the practice of the rhythmic excitations

and should continue them until the animal again begins to breathe spontaneously.

The dogs on which these experiments have been made were of various sizes and breeds, ranging in weight between ten and eighty pounds.

When the head is excluded from the circuit, good results are obtained with various currents. In the near future I hope to present in detail researches into the comparative value of various electric currents used for rhythmic excitations to resuscitate animals in a condition of apparent death caused by electric shock, chloroform (see my paper entitled "The Method of Resuscitating Animals in a Condition of Respiratory Syncope, Caused by Chloroform," Journal of Mental Pathology, Vol. VIII., No. 3, 1907), ether, etc.

For the present I wish to point out the utility of the induction current and the Leduc current for the purpose of resuscitating animals in a condition of apparent death, caused by electric shock, chloroform, ether, etc. The utility of the induction current is of particular interest, because it can be procured and handled more readily than can a current requiring complicated instrumentation.

I am indebted to Professor Rouxeau, of Nantes, for his kind advice in this work.

GENERAL AND CEREBRAL BLOOD PRESSURE DURING AN ATTACK OF ELECTRIC EPILEPSY.*

A PRELIMINARY COMMUNICATION.

By Louise G. Robinovitch, *B. ès L., M. D., Paris, Member, New York Academy of Medicine; Member, American Medical Association; Foreign Associate Member, Medico-Psychological Society, Paris.*

1. Electric epilepsy of which I speak in this paper is produced by a direct electric current interrupted 110 times per second and passing one-tenth of the entire period, as is explained in my Paris thesis, 1906, "Sommeil électrique, épilepsie électrique et électrocution."

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* Presented at the Congress of French Alienists and Neurologists, held at Geneva, Switzerland, August 1-7, 1907.

Presented at the International Congress of Psychiatry, Neurology and Psychology, held at Amsterdam, Holland, September 2-7, 1907.

2. Electric epilepsy is induced by passing the above mentioned current through an animal's body during a period of four seconds. The cathode is fixed at the head and the anode at the lower part of the spine. For a rabbit the required potential is 55 volts; for a dog—110 volts.

3. The tonic phase of the epileptic attack begins as soon as the current begins to course through the animal's body.

4. The blood pressure begins to increase a few seconds after the closing of the circuit; it is perhaps more correct to say that the increase of the blood pressure is noticed immediately after the opening of the circuit. The blood pressure increases progressively and reaches its maximum when the *clonic* convulsions are at their maximum. Then, as the *clonic* convulsions decline, the blood pressure decreases accordingly, falling gradually to the normal level with the final disappearance of the *clonic* convulsions.

CEREBRAL BLOOD PRESSURE.—The brain of a dog is exposed by trephining its skull (during electric anesthesia: see my paper on "Electric Anesthesia. Its Use in Laboratory Work," JOURNAL OF MENTAL PATHOLOGY, Vol. VIII., No. 3, 1907), and the epileptic attack is induced as is explained in my thesis cited above.

1. During the period of the passage of the current (four seconds) the brain seemed to me to grow considerably paler than normal (one of two colleagues who were present at this operation did not consider this pallor sufficiently marked to warrant affirmative opinions on the subject).

2. After the opening of the circuit and during the continuation of the *tonic* phase of the attack the cerebral matter becomes progressively pink in color; the cerebral vessels become visibly dilated as the *clonic* convulsions take place, and this dilatation causes the vessels to reach twice or three times their normal size at the moment when the *clonic* convulsions are at their maximum.

CONDITION OF THE CEREBRAL MASS DURING AN ATTACK OF ELECTRIC EPILEPSY.—1. The cerebral mass exposed by trephining begins to increase in volume as soon as the cerebral blood vessels begin to increase in volume—after the breaking of the circuit. And the cerebral mass continues to increase progressively in volume in proportion to the increase of the blood pressure—while the tonic and the clonic convulsions are being manifested. The exposed cerebral mass finally increases to such an extent that it protrudes from the cranial opening in the shape of a hernia; the maximum size of this hernia corresponds to the maximum intensity of the *clonic* convulsions.

2. The cerebral hernia begins to decrease in volume with the decrease of the intensity of the *clonic* convulsions, and the cerebral hernia returns to its normal position within the cranial cavity when the *clonic* convulsions cease.

3. The general blood pressure in electric epilepsy is presented by tracings published in my thesis cited above as well as in the tracings which I have the honor of presenting to you to-day.

4. The cerebral blood pressure during an attack of epilepsy was studied and published by Dr. V. Magnan, thirty years ago *(Leçons cliniques sur les maladies mentales, Paris)*. His researches deal with epilepsy caused by absinthe. My experiments —on electric epilepsy in dogs—show similar results as regards the cerebral blood pressure.

I present my sincerest thanks to Dr. Rouxeau, Professor of Physiology, School of Medicine, Nantes, for his collaboration in this work.

July 15, 1907.

ELECTRIC ANESTHESIA. ITS USE IN LABORATORY WORK.*

By Louise G. Robinovitch, *B. ès L., M. D., Paris, Member, New York Academy of Medicine; Member, American Medical Association; Foreign Associate Member, Medico-Psychological Society, Paris..*

In my paper entitled "Electric Sleep," etc., published in the Journal of Mental Pathology, Vol. VII., No. 4, 1905, I mentioned the fact that I had experienced complete anesthesia in my forearm while it was being subjected to electric anesthesia. In my Paris thesis, entitled "Sommeil électrique, épilepsie électrique et électrocution," presented July 5, 1906, I published comparative studies of anesthesia of long duration, induced by ether, chloroform and electric currents—respectively, showing that in laboratory work electric anesthesia was preferable to the other two forms of anesthesia for many reasons; on the date of presentation of my thesis I stated to my jury that I had used electric anesthesia for laboratory work and had obtained good results.

* Abstract presented at the International Congress of Psychiatry, Neurology and Psychology, held at Amsterdam, Holland, September 2-7, 1907.

The tracings of the blood pressure, temperature and respiration during electric sleep of long duration are published in my thesis cited above. The longest duration of this anesthesia was recorded by me in the same thesis, 8 hours and 20 minutes. The advantages of electric anesthesia are as follows below:

1. The blood pressure, respiration and temperature remain about normal, even when the anesthesia is prolonged for eight hours or a longer period of time.

2. Chloroform or ether anesthesia in animals causes death if prolonged for two hours.

3. Electric anesthesia can be induced not only centrally, but also locally or regionally.

4. I have been using electric anesthesia in laboratory operations on animals since the date cited above and have never lost any animal from the effects of this anesthesia.

5. The voltage necessary to induce electric anesthesia is so small (from 5 to 10 volts for a dog weighing from 10 to 80 pounds) that danger to life from this potential is entirely out of the question.

6. Electric anesthesia is suspended as soon as the circuit is broken and there are no after effects from this form of anesthesia.

7. The operations which I have performed with electric anesthesia are important, as they comprise trephining of the skull and exposure of the brain, exposure of the carotid artery and the pneumogastric nerve, abdominal section, etc.

Since the publication of my papers on electric anesthesia, Professor Tuffier and his interne, Dr. Jardry, have tried this form of anesthesia on dogs (*Presse Médicale*, April 20, 1907).

Anesthesia produced by electricity differs from that caused by chloroform or ether in some particulars: there is a given degree of satisfactory electric anesthesia that may be induced by a given voltage; if this potential is decreased by one or two volts—the anesthesia ceases and the animal wakes up; if the potential is increased by one or two volts—the animal becomes agitated by a convulsive tremor in its whole body, crying out with pain.

From the point of view of anesthesia as we understand the term in surgery, electric anesthesia does not correspond exactly to chloroform or ether anesthesia: during electric anesthesia the superficial reflexes are exaggerated, the animal is very apt to open its eyes, lift its head, make some defensive movements and even cry out—then fall back on the operating table and remain quiet again. This may be repeated several times during a long operation.

To judge from the anesthesia I experienced in my forearm in

the experiment made in 1905, it is legitimate to conclude that animals subjected to this form of anesthesia do not suffer pain during an operation and that the defensive movements are due to incomplete abolition of consciousness.

The results obtained from the use of electric anesthesia in my daily laboratory work during the last two years have been satisfactory—there having been no case of death from this anesthesia among the numerous animals subjected to this sleep. I recommend this form of anesthesia for laboratory surgery; electric anesthesia should replace chloroform and ether anesthesia in laboratory work.

While operating on animals subjected to electric anesthesia the operator's hands are in the electric circuit, and he experiences now and then slight tingling in his fingers. The question of application of electric anesthesia in man is as yet to be studied. The potential necessary to induce central electric anesthesia in man is probably from 50 to 80 volts, more or less. The surgeon's body may be excluded from the circuit by spreading a rubber sheet under his feet; but this does not exclude his hands from the circuit, and tingling of the fingers is a serious drawback during a major operation requiring delicate handling. Rubber gloves may also be considered as a means of keeping the operator's hands out of the electric circuit.

Electric anesthesia causes abortion in pregnant animals. The bowels are always emptied during electric anesthesia.

The electric current necessary to induce electric anesthesia is a direct current interrupted 110 times per second and passing one-tenth of the entire period.

For details of the technique see my papers cited above.

METHODS OF RESUSCITATING ANIMALS IN A CONDITION OF RESPIRATORY AND CARDIAC SYNCOPE CAUSED BY CHLOROFORM. VARIOUS ELECTRIC CURRENTS USED. IMPORTANCE OF EXCLUDING FROM THE CIRCUIT THE CENTRAL NERVOUS SYSTEM. EXPERIMENTAL STUDY.*

A PRELIMINARY COMMUNICATION.

By Louise G. Robinovitch, *B. ès L. M.D., Paris; Member, New York Academy of Medicine; Member, American Medical Association; Foreign Associate Member, Medico-Psychological Society, Paris.*

Animals in a condition of respiratory and cardiac syncope may be resuscitated by means of rhythmic excitations caused by electric currents in the same manner as I practice rhythmic excitations for the purpose of resuscitating animals in a condition of apparent death due to electric shock (see my paper "Methods of Resuscitating Electrocuted Animals. Different Effects of Various Electric Currents According to the Method Used. Importance of Excluding the Central Nervous System from the Circuit during Resuscitation," Journal of Mental Pathology, Vol. VIII, No. 3, 1907).

The preliminary operation for the purpose of connecting the carotid artery with the manometer (simple manometer of François-Franck) is performed while the animal is under the influence of electric anesthesia (see my paper "Electric Anesthesia. Its Use in Laboratory Work," Journal of Mental Pathology, Vol. VIII, No. 3, 1907).

Mode of Procedure.—The Claude Bernard cradle is put upon the operating table and two electrodes, measuring each about 11 x 18 centimeters, are placed in the groove of the cradle—so as to correspond to two shaven parts on the animal's back; one—on the back of the chest beginning below the root of the neck; the

* Part of the experiment presented by invitation at the Moabit Krankenhaus, Berlin, Germany, September-October, 1907.
Part of the experiment presented by invitation at the Rudolf Virchow Krankenhaus, Berlin, Germany, October, 1907.

other—at the lower part of the spine. The animal's fur is closely cut in three parts of its body: at the back of the chest, at the lower part of the spine and at the head. When the animal is put on its back—in the Claude Bernard cradle,—each of the two shaven parts of its back corresponds to one of the large electrodes. The animal's head and paws are now tied to the cradle, and the head electrode, measuring about 10 x 10 centimeters, is fixed on the head by means of two rubber rings. The large electrodes on the back are pressed closely around the chest and back, and the weight of the animal keeps them in place. The electrodes and the animal's skin are thoroughly wet with a normal salt solution. The electrode at the lower part of the spine is the anode; the electrode at the head is the cathode—during the preliminary operation—while the animal is under the influence of electric anesthesia. The wire of the electrode at the back of the chest is not in the circuit for the time being. Electric anesthesia is now induced by closing the circuit of a Leduc current, as follows below:

The negative pole of an electric source of a direct current is connected with the reducer of potential, a Leduc interrupter (110 interruptions per second, the current passing 1/10 of the entire period) and finally—with the electrode at the head. The positive pole is connected with a milliamperemeter, a small mercury interrupter and with the electrode at the lower part of the spine. A voltmeter is put in derivation. The circuit is closed by means of the mercury interrupter and the voltage is gradually increased by shifting the handle of the reducer of potential. The animal shows slight excitation and tremulation of the entire body until the proper voltage is reached. The proper voltage for a dog is from 5 to 10 volts, the milliamperemeter indicating from 1.5 to 3 milliamperes. The animal now remains quiet and may be operated upon. The carotid artery is now exposed and connected with the manometer. Electric anesthesia is now discontinued, and the animal is chloroformed. As soon as the chloroform anesthesia is complete, an assistant frees the animal's head and paws, drops the head electrode, connects the wire of the chest electrode with the mercury interrupter, while the operator catches hold of the tip of the animal's tongue with a pair of surgical clamps and cleanses the mouth of all mucus. The blood pressure falls during the chloroforming, but always rises to the extent of from 2 to 4 centimeters of mercury while the animal's mouth is kept open; but the blood pressure falls again as soon as the chloroforming is resumed; as soon as this pressure is registered by some 5 or 6 centimeters of mercury, the operator changes place with the assistant; the latter administers the chloroform, keeps the animal's mouth

clean of mucus and is ready to discontinue the chloroform as soon as respiratory or cardiac syncope is induced—the blood pressure generally registering at such a time from 3 to 5 centimeters of mercury. The operator begins to practice rhythmic excitations a few seconds after the onset of the respiratory syncope—when spontaneous respiration seems to be impossible. If cardiac syncope sets in first, the rhythmic excitations should be begun at once.

VOLTAGE NECESSARY FOR CAUSING AMPLE RESPIRATORY REACTION—THE CENTRAL NERVOUS SYSTEM BEING EXCLUDED FROM THE CIRCUIT.—The first rhythmic excitation may be caused with from 20 to 40 volts of the Leduc current. The voltage is then increased or decreased—according to the amplitude of the respiratory reaction. The rhythmic excitations are practiced during one second and at intervals of from 2 to 3 seconds,—according to the gravity of the syncope and especially according to the energy of respiratory and cardiac reaction. In the majority of cases, spontaneous respiration and cardiac reaction takes place after some 10 or 20 rhythmic excitations have been practiced. As soon as the first spontaneous respiration is noticed, the rhythmic excitations should be suspended. Death is apt to be caused instantly—if a rhythmic excitation is allowed to encroach on a spontaneous respiration. In many cases spontaneous respiration does not take place for a long time—2 or 3 minutes; but the operator should keep on practicing the excitations even when the case seems hopeless; I have obtained many tracings showing the onset of spontaneous respiration after a period of from two to three minutes,—during which the rhythmic excitations have been practiced—although the cases seemed to be hopeless.

Respiratory and cardiac reaction may be obtained with a smaller voltage if the head is included in the circuit. But there is great danger in allowing the central nervous system to remain in the circuit during the rhythmic excitations. I have obtained fatal results in several series of experiments in which the head was in the circuit during the rhythmic excitations. For details on this subject see my paper "Methods of Resuscitating Electrocuted Animals," etc., cited above.

CARDIAC REACTION DURING THE RHYTHMIC EXCITATIONS.—The heart contracts with every rhythmic excitation. If respiratory syncope sets in before the cardiac syncope, the operator watches the pressure in the manometer and times the rhythmic excitations so that they do not encroach on cardiac contractions. The rhythmic excitations are suspended as soon as the first spontaneous respiration takes place; the heart action then becomes

gradually stronger in proportion to the increased energy of the spontaneous respiration. But there are exceptional cases in which the heart stops beating before respiratory syncope sets in, the blood pressure falling abruptly to some 4 centimeters of mercury and remaining stationary at that level. Respiratory syncope then follows immediately the cardiac syncope; such respiratory syncope may be replaced by spontaneous respiration—after a few rhythmic excitations have been practiced; but the operator is confronted with great difficulty in restoring the heart action by means of rhythmic excitations: the animal is apt to be killed instantly if a rhythmic excitation is allowed to encroach on a spontaneous respiration; and the animal is certain to succumb—if rhythmic respirations are not practiced in order to restore cardiac function. Hence,—the operator must practice rhythmic excitations—but only at chosen moments—*between* the inspiratory movements, or, to be more precise—immediately after each expiratory movement. I have cardiac and respiratory tracing of such a case, in which rhythmic excitations had to be practiced during a period of one minute and forty-five seconds—before spontaneous cardiac contraction took place. The respiratory tracing represents a long series of alternations of spontaneous respirations and rhythmic excitations.

Respiratory Reaction During the Rhythmic Excitations. —The animal's mouth is kept open and its tongue is held close to the lower jaw—without hindering its movements during the respiratory acts. Each rhythmic excitation is followed by an inspiration of maximum amplitude and by a corresponding expiratory movement; if properly performed, the inspirations are followed by forceful expirations, the noise of which is heard in the laboratory at a distance. The force of respiratory reaction is as marked as it is interesting to observe: the chest dilates to its maximum capacity; the lifeless tongue that fell in a flabby mass to the roof of the mouth (the animal is on its back) assumes marked tonicity during the rhythmic excitations and stretches out along the floor of the mouth; as the chest dilates to its maximum capacity, the forepaws project with great vigor upward (the animal is on its back), the diaphragm contracts with great force and pushes the visceral organs downward, while the hind paws also contract vigorously. The breaking of the circuit is followed by correspondingly vigorous expiratory movements.

Abnormal Respiratory and Cardiac Syncope.—In exceptional cases spontaneous respiration or cardiac beats may cease—after they have been brought about by means of rhythmic excitations. The operator should immediately resume the practice of

rhythmic excitations and try to resuscitate the animal as he did in the first place.

DIFFERENT ELECTRIC CURRENTS USED.—I have used various electric currents for the purpose of causing rhythmic excitations during respiratory and cardiac syncope. The same method was used with all the currents,—one electrode being applied at the back of the chest and the other at the lower end of the spine. I have obtained satisfactory results from the use of various currents. The mode of aplication of the Leduc current is explained above. For the induction current I use the Dubois-Raymond apparatus, running on 8 volts of accumulators, coil No. 2. The two electrodes on the animal's back are connected with this apparatus and the mercury interrupter; when the circuit is closed, the rhythmic excitations are practiced as is explained above, and the voltage is increased according to the respiratory and cardiac reaction—by shifting the coil toward or from *O* on the scale.

The method of resuscitating animals in a condition of respiratory or cardiac syncope due to poisoning with chloroform or ether is of practical importance in surgery. The method of administering anesthetics is perfected to-day, but occasional cases of chloroform or ether syncope still present themselves from time to time. I was highly pleased, therefore, when the leading surgeons of Berlin, Germany, accepted the demonstration of my experiments in the line of work with the consideration due to the importance of the subject (see Dr. Gradenwitz's abstract of some of my experiments made in Berlin, September-October, 1907, in "Western Electrician," November 23, 1907, article entitled "Electric Sleep and Resuscitation from Electric Shock").

All the animals used in these experiments were dogs of various breeds, ranging in weight from 10 to 80 pounds. The amount of chloroform used varied from 15 to 70 grams. There is no correspondence between the size of the dog and the amount of chloroform necessary to cause respiratory or cardiac syncope.

There are many other forms of cardiac and respiratory syncope in which it seems useful to try the method of resuscitation considered in this paper. I have a series of experiments relating to this method of resuscitation of animals in a condition of syncope due to morphine and hyoscyamin poisoning; some of the results obtained are satisfactory.

In the near future I hope to present a study of the comparative value of various electric currents for the purpose of resuscitating animals in a condition of respiratory and cardiac syncope due to poisoning with chloroform, ether, morphine, etc.

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NICOLAS VASCHIDE.

Nicolas Vaschide died October 13, 1907, at his home, in Paris. The scientific world who knew Nicolas Vaschide by the reputation he had made for himself as a psychologist is astonished to learn that he was only a young man—in the prime of life. He was born at Buzeu, Roumania, December, 1873. During the last ten years Nicolas Vaschide contributed scientific papers to every leading publication on psychology, psychiatry and philosophy. He was a strenuous worker, and the enormous yearly output of his excellent papers and volumes treating of psychology, psychiatry and philosophy astonished even the most energetic workers in our profession.

His method of study of psychology is familiar to us all: it was clinical or based on laboratory experiments. It was individual and as forceful as was the personality of Vaschide himself.

His contributions to this JOURNAL are familiar to our readers; and the enumeration of a few of his researches that follows below shows how broadly he had outlined his work in psychology.

N. Vaschide and H. Pieron.—The Symptomatic Value of Dreams, *Journal of Mental Pathology,* Vol. I, No. 2.

N. Vaschide and Vurpas.—On the Mental Analysis, *Journal of Mental Pathology,* Vol. II, No. 2.

N. Vaschide and Meunier.—On the Cutaneous Temperature in the General Paralytics, *Journal of Mental Pathology,* Vol. III, Nos. 2-3.

N. Vaschide and Meunier.—Contribution to the Study of Mental Impulses, *Journal of Mental Pathology,* Vol. V, Nos. 4-5.

N. Vaschide and M. Lahy.—La téchnique de la mesure de la pression sanguine particulièrement chez l'homme, *Arch. Générales de Médecine,* Vol. VIII, 1902.

N. Vaschide and M. Lahy.—La téchnique sphygmographique, *Revue de médecine,* 1904.

N. Vaschide, Pieron and Toulouse.—Technique de Psychologie expérimentale, Doin, Paris, 1904.

N. Vaschide and Vurpas.—La logique morbide; preface by Ribot, Rudeval, Paris, 1902.

N. Vaschide and Vurpas.—Essai sur la psychologie des monstres humains. Un anencéphale. Un xiphopage, Rudeval, 1902, Paris.

N. Vaschide and Vurpas.—Recherches expérimentales sur la psychophysiologie du sommeil, *Académie des Sciences,* March 23, 1903, Paris.

N. Vaschide and Vurpas.—Le rythme vital, *Académie des Sc.,* Nov. 3, 1902.

N. Vaschide and Piéron.—La psychologie du rève au point de vue médicale, Masson, Paris, 1902.

N. Vaschide and Raymond Meunier.—La memoire du rève et la memoire dans les rèves, *Revue de philosophie,* Oct.-Dec., 1906.

N. Vaschide and Raymond Meunier.—Des caractères essentiels de l'image onirique, *Annales des Sc. psychiques,* October, 1903.

N. Vaschide and Cl. Vurpas.—Contribution expérimentale à la physiologie de la mort, *Académie des Sc.,* April 14, 1903.

N. Vaschide.—Recherches expérimentales sur les hallucinations télépathiques, *Bull. Soc. Sc. de Bucarest,* XI, Nos. 5, 6.

N. Vaschide.—Taste,—in *Dictionnaire de Physiologie,* Charles Richet.

N. Vaschide.—Essai sur la psychologie de la mort (edited on his death bed and submitted to the printers).

N. Vaschide and Raymond Meunier.—Essai sur la psychologie de l'attention.

Nicolas Vaschide was engaged in editing several volumes of psychology—based on his experimental studies,—when he was overtaken by a fatal illness. Editing *several* volumes was not an unusual undertaking for Vaschide. While on his death bed, he was surrounded by his manuscripts, published papers and volumes and he edited many chapters of the volumes on experimental psychology he had hoped to publish. He died at this task on the 30th day of his illness.

His numerous works that have appeared in print indicate to some extent the latitude of his scientific activity. The brilliancy of his work first attracted attention while he was a college boy in his native country, and he was awarded the First Prize for his thesis presented to obtain the degree of *A. B.* at the University of Bucarest. He came to Paris in 1895 and was soon appointed Assistant at the Laboratory of Physiological Psychology, directed by Prof. Binet. Later he was appointed Chief of the Laboratory of Experimental Psychology, at Villejuif; and finally he was appointed Adjunct Director of the Laboratory of Pathological Psychology at Villejuif. He was Laureate of the Academy of Medicine, Paris, and was awarded the Prize of the College de France. He was member of the Société Biologique, Athropologique, Sociologique, etc., etc.

Such was the professional activity of Nicolas Vaschide.

His reputation was international, and his death has called forth expressions of sincerest condolence from colleagues in all parts of the world. And those of us who knew him personally feel that we have lost in him an excellent colleague, a warm friend and a brilliant mind.

He leaves a widow and one son. We extend to them the expression of our deepest condolence.

BOOK REVIEWS.

L'Endemia Gozzo-Cretinica Nellie Famiglie. Pp. 236. Rome, 1907. By U. Cerletti and G. Perusini. Previous researches by these authors into endemic cretinism and congenital goitre were published in this Journal. The present work is a continuation of the same studies. One hundred and four subjects belonging to 25 families are studied in the present work. The ascendents' histories are followed out to the fourth generation.

Ninety-eight of the 104 cases present marked alterations of the thyroid gland; 45 cases present somatic and psychic symptoms related to goître; 5 subjects are "normal." Alterations of the thyroid gland is a predominant feature in these cases. Only one of these cases was the offspring of parents who seemed to be free from goître, but there is some question about the matter. On the other hand, there was one "normal" offspring, whose parents and all the members of the collateral branches of the family were afflicted with congenital goître. Some of the "normal" subjects, born of parents with congenital goître present idiocy with cerebroplegia and other disturbances that do not seem to be related to thyroidism. The study of endemic cretinism warrants the conclusion that it is a disease of familial type. It is difficult to explain, however, the coexistence of cretins and "normal" subjects in the same family. It may be supposed that certain specific conditions of the mother during conception and gestation have an influence on the genesis of endemic cretinism. The authors have not been enabled to learn definitely whether the cretins are always born in a condition of myxedema.

Lecons Cliniques sur l'Hysterie et l'Hypnotisme—By Dr. A. Pitres, *Professor of Nervous Diseases and Dean of the Faculty of Medicine, Bordeaux.* Two Volumes. Octave Doin, Paris. These two volumes represent a collection of clinical lectures on hysteria, its complex manifestations and on hypnotism. Professor Pitres treats of this subject with its usual lucidity and erudition. The leading schools on hypnotism are considered and clinical facts are given due credit. Both volumes are published in large Octavo; volume No. I contains 531 pages and 75 cuts; volume No. II, contains 551 pages and 58 cuts. Among the various hysterical manifestations the following subjects are considered: anesthesia, tremors, rhythmic spasms, spasmogenic and hypnogenic zones, hypnotic suggestion, attacks of contractures, hysterical epilepsy and delirium and the various morbid and psychic manifestations that can be induced in hysterical subjects during the hypnotic state. These two volumes represent an exhaustive treatise on the subject of hysteria, its various phenomena and its manifestations during hypnotic sleep.

Le Langage Musical et ses Troubles Hysteriques.—By Dr. J. Ingegnieros, *Professor, University of Buenos-Ayres.* The psychology of musical evolution in man is presented in the first part of the work. The psycho-physiology of musical emotions is then considered—in relation to various degrees of musical

emotivity—from the idiot to the genius. The second part of the work is devoted to the study of musical language in hysterical subjects; the study deals with amusia or musical aphasia, which is analogous to common aphasia; hypermusia and paramusia. The author shows erudition in the handling of the subject and the volume presents interesting reading. Large octavo volume of 208 pages, price 6 francs. Félix Alcan, Paris, 1907.

Lesions et Particulierement l'Ion Iode. Etude Physique et Therapeutique. By Dr. Raymond Brillouet. J. B. Ballière and Sons, Paris, 1908. This small volume of 128 pages contains the latest studies on clinical electrolysis. The iodide salts are especially studied and clinical cases treated with this method are reported. An extensive bibliographic list is appended to this excellent little volume.

The Phenomenon of Conciousness in Ontogenesis.—Dr. Lahy.—Ablation of the brain destroys the sense of consciousness. Goltz's dog in which the cerebral convolutions had been extirpated, continued to live for 18 months, but the animal was not conscious of its surroundings. In human beings gradual disintegration of consciousness is exemplified in general paralytics, in whom the cerebral cortex is progressively atrophied. An anencephaliac cannot manifest any signs of consciousness. Vaschide and Vurpas's statements about the manifestations of the anencephaliac they had studied is criticised. While it may be said that a child manifests signs of consciousness some few days after birth, it is only after the sixth month that elementary consciousness properly speaking may be considered (*Arch. de Neurologie,* Oct.,

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Lumbar Puncture in Children.—Dr. Aug. Ley gives the following conclusions:

1. Lumbar puncture in children may be considered as harmless if caution is observed. In children under two years of age the puncture should be made in the lumbo-sacral region.

2. The examination of the cerebro-spinal fluid furnishes most important diagnostic indications, and every practitioner should be familiar with this method. At present this aid in diagnosis is applied mostly in meningeal inflammations.

3. Lumbar puncture relieves patients suffering from meningitis, and has curative effects in hydrocephalus and the acute meningites. The punctures should be made at repeated intervals in the latter conditions.

4. The harmlessness of the operation warrants its being tried in various affections, among which may be mentioned chorea,

whooping-cough, eclampsia, uremia and urinary incontinence (*Journal de Neurologie,* No. 18, 1905).

Emotions on Witnessing Capital Punishment.—Prof. Sikorki: physicians who have witnessed many capital punishments say that the sight of an execution always produces a profound impression on them. One French physician, who had witnessed a large number of executions and who believed in the value of capital punishment, said that regardless of his convictions on the subject, the sight of an execution always produced a powerful impression on him, leaving him saddened and depressed for some time. The same physician says that although he does not agree with Tarde that capital punishment should be abolished, he does agree with him that the practice is a horrible butchery of the human body. Dostoevski's immortal verses of the man condemned to death (Polejaeff) are quoted showing that the poet's appreciation of a condemned man's psyche corresponds to the psychiatrist's knowledge of the same. A celebrated case of capital punishment in Russia is then cited, showing that even an accustomed hangman is profoundly affected by performing the duty imposed upon him by the authorities: a prisoner was instigated by a desperate criminal in the same prison to kill an orderly there. The prisoner was then condemned to death and hanged. The hangman was so impressed by his own deed that he deserted his post and killed himself. Other dramatic incidents are also related, being direct results of the impression caused by taking a human life—lawfully. Russian thinkers are doing their best to have capital punishment abolished (*Voprossi Nervno-Psychiatritcheskoi Medizini,* Vol. X, 1905).

On the Fibrillary Structure of the Spinal Nervous Cells in a Case of Myopathia.—Dr. V. M. Verzilov: the number of nervous cells was not decreased and there could be no question of cellular atrophy. Alongside with the normal cells, however, there were cells that presented central or peripheral chromatolysis more or less marked. In some cells the chromatic substance was entirely destroyed, the cells themselves being swollen and the nuclei displaced toward the periphery. In a large number of the cells the neurofibrillary network remained normal, but in some cells there was degeneration of this network—from the centre to the periphery. The patient had been affected with the progressive muscular atrophy for fifteen years. The good condition of the nervous cells did not correspond to the pronounced muscular

atrophy (*Journal Nevropatologii Imeni Korsakova,* Nos. 3-4, 1905).

The Present Status of Treatment with Light.—Dr. Grudzinski: light is an important excitant agent of the central nervous system as well as of the sensory nerve endings. Excitation of the peripheral nerve endings is a necessary intermediary process, however, before the central nervous system can be reached. In frogs excitability in general is increased under the influence of light. Dermic excitability is also increased under the influence of light. The influence of light on the psychic sphere is marked, as every day experience demonstrates: fine weather makes us feel energetic, while bad weather has the opposite effect. In England bad weather causes a decrease of 10 per cent. of work accomplished in factories as compared with the amount of work accomplished in fine weather. In bad weather there are many more accidents and suicides than in fine weather. Light seems to be one of the constant stimuli necessary for the continuance of normal life. The different effects of various colors are also well known, red and yellow, for instance, having an excitant effect, while blue is depressing in its effects. The influences of light on the various tissues of the organism is considered in detail (*Russky Medizinski Vestnik,* Vol. V, No. 5).

Adolescent Insanity: a Protest Against the Use of the Term Dementia Precox.—Dr. J. C McConaghey: in 1863, Kalbaum described a form of mental disease occurring at puberty and rapidly terminating in dementia; this is called hebephrenia. In 1874, the same author described the condition known as katatonia or insanity of rigidity. These terms do not appear to have been adopted till 1891, when Pick, under the heading of dementia precox, described cases including hebephrenia, characterized by maniacal symptoms followed by melancholia and rapid deterioration. This term has now been extended by Kraepelin, including under it hebephrenia and katatonia of Kalbaum together with certain forms of paranoia that undergo early deterioration. The author objects to the term dementia precox as applied to recent and curable varieties of mental disease, as it is unscientific to label a case as suffering from dementia and then to have to record such a patient's recovery, as must often be the case under the circumstances. The author proposes the adoption of the term adolescent insanity, and suggests its division into three groups: simple, delusional and katatonic (*The Journal of Mental Science,* April, 1905).

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RESUSCITATION OF SUBJECTS IN A CONDITION OF APPARENT DEATH CAUSED BY CHLOROFORM, ETHER, ELECTROCUTION, DROWNING, ETC. NECESSITY OF EXCLUDING THE CENTRAL NERVOUS SYSTEM FROM THE CIRCUIT DURING THE RHYTHMIC EXCITATIONS. CLINICAL APPLICATION OF THE METHOD.*

BY LOUISE G. ROBINOVITCH, B. ÈS L., M.D.,
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(*From the laboratory of Dr. V. Magnan, Directed by Dr. Robinovitch, Bureau of Admission, Ste.-Anne Asylum, Paris.*)

Cases of chloroform syncope and even death caused by chloroforming for surgical purposes occur now and then; but the means of resuscitating such subjects are quite limited, as these means are confined to rhythmic traction of the tongue (Laborde), artificial respiration (Sylvestre's method), respiratory stimulants, rhythmic contractions of the chest and even cardiac massage. In cases of grave syncope caused by chloroform none of these means is efficacious and death takes place even after heart beats and spontaneous respiratory movements have been obtained during a few minutes.

*Read and experiments demonstrated at a meeting of the *Société Clinique de Médecine Mentale*, Paris, November, 1908.

Experiments demonstrated at the following meetings: Nineteenth Annual Meeting of the American Electro-Therapeutic Association, September 29, 1909; New York Academy of Medicine, November 4, 1909; The New England Association for Physical Therapeutics, November 12, 1909, Boston, Mass.

The failure to revive subjects in a condition of grave chloroform syncope is due to several causes, as the mechanism of apparent death caused by chloroform is not the same in all subjects: death may be caused now by cardiac paralysis, now by respiratory paralysis, now by synchronous paralysis of both the cardiac and respiratory centers; sometimes death sets in slowly, gradually, but at others, death takes place suddenly—without any warning.*

In view of these various modes of syncope, it is necessary to have a sufficiently adequate means of resuscitation applicable to the various cases; thus, for instance, a subject whose heart is suddenly and profoundly paralyzed with chloroform cannot be resuscitated by means of artificial respiration—because the circulation is thereby not re-established: either because the artificial respiration is insufficient to provoke cardiac beats, or if these beats are brought about, they are too feeble to re-establish the circulation.

On the other hand, in cases of profound respiratory paralysis, the ordinary means of resuscitation are useless; and in cases of synchronous cardiac and respiratory paralysis, even the extraordinary means of resuscitation, such as direct cardiac massage, are also useless in grave forms; besides, the loss of time necessitated by the operation for the exposure of the organ and the risks incurred by the possible results of the operation should be borne in mind. A detail of some importance is the fact that in the cases of grave chloroform syncope in which direct cardiac massage had been practiced, the subjects died within from a few minutes to one-half hour after the successful resuscitation. We speak of such cases that have come to our notice.

When we speak of cardiac or respiratory syncope in our experi-

* The term syncope in the language of the surgeon does not correspond exactly to the same term in the language of the physiologist. The surgeon considers his subject in a condition of respiratory syncope when there is no visible sign of respiration. But physiologically the sheer absence of visible respiratory movements does not indicate that there is arrest of respiration, because this function may continue without causing chest movements perceptible to the eye or hand. Cardiac syncope—surgically speaking—is a condition in which the pulse in the arteries cannot be felt with the fingers and when the heart beats cannot be heard with the ear. But physiologically, the heart may continue to beat feebly without causing perceptible impulses to the finger applied to the artery or to the ear applied to the cardiac area. Physiologically—in our experiments—we say that there is cardiac syncope when the blood pressure in the large arteries ceases to be registered by the manometer, the mercury column falling to zero. Zero of pressure in these experiments is not indicated by zero on the scale for physical reasons, the level of the mercury reaching to from 2 to 4 mm. But the blood pressure is zero, nevertheless.

ments, these terms are used in the physiological sense as is explained in the foot-note.

In our experiments we have tried the application of a method of resuscitation of practical value in cases of grave syncope and apparent death; a method that could be applied without great loss of time, and that would produce within a minimal loss of time synchronous artificial respiration and heart beats. For this purpose we use various electric currents that produce respiratory movements of required amplitude accompanied by cardiac beats; the latter are feeble at first, but their force is gradually increased with the good progress of the respiration; and when spontaneous respiration is sufficiently established the spontaneous heart beats also increase in amplitude and the application of the electric currents may then be withdrawn.

Some details of the *modus operandi* are given below.

The blood pressure is taken in the carotid or femoral artery. The surgical operation for exposing either one of these arteries is performed under the influence of electric anesthesia (1) which we were first to use for the first time in 1906 as a substitute for ether or chloroform, and have continued its use up to date in our laboratory surgery. The animal is fixed in the Claude-Bernard cradle, the artery exposed and connected with the manometer; the pneumograph is adjusted to the chest; the animal's paws and head are fixed in their respective places. This precaution is taken because chloroform produces marked excitement of the animal even during the electric anesthesia. The chloroforming is pushed intensively with the purpose of causing apparent death of the animal as quickly as possible. For this purpose the chloroforming is necessarily performed rather roughly—by reducing—by means of a cotton tampon—the entrance of air into the chloroform funnel. The funnel is an improvised affair, made of soft rubber sheeting so that it can be moulded around the animal's snout and the air excluded as much as possible. Absorbent cotton saturated with chloroform is placed in the narrow part of the funnel and the wide part is fitted closely around the snout. Electric anesthesia is suspended before the chloroforming is begun.

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1. Dr. Louise G. Robinovitch.—Electric Sleep. An Experimental Study with an Electric Current of Low Tension. Illustrated with Cardiac and Respiratory Tracings, *The Journal of Mental Pathology*, Vol. VII. No 4. 1905.

Sommeil éléctrique, épilepsie éléctrique et éléctrocution; Paris Thesis, 1906.

Electric Anesthesia or Electric Sleep; *Reference Handbook of the Medical Sciences*, Wood and Co., 1907.

Marked agitation characterizes the first stage of chloroforming: the animal struggles with all its might to free itself; its respiratory movements are now of maximum amplitude, so that the rubber sheeting of the pneumograph is apt to be ruptured unless precaution is taken by opening the safety valve of the apparatus. The blood pressure that registered 18 cm. of mercury before the chloroforming was begun, mounts abruptly to 20, 25, 28, 30 cm., or even higher. During the stage of agitation the blood pressure may become so high that the indicator in the manometer (of François-Franck) is expulsed from the tube. For these experiments and for those of resuscitation of electrocuted subjects we use Marey's manometer, modified according to our indications, so that the mercury may rise to 45 cm. without inconvenience.

The dose of chloroform necessary to cause apparent death varies with each animal, because the mechanism of death by this poison varies with each animal. In dogs, apparent death may be caused with from 10 to 40 grams,—irrespective of the size or the weight of the animal.

The duration of chloroforming for inducing apparent death also varies with each animal.

Our Method of Resuscitation.—Before the animal is put on the Claude-Bernard rack everything is prepared for the practice of resuscitation: the dog's back is shaven in two parts,—one in the dorsal and the other in the lumbar region; electrodes are applied—one to each shaven part; the cathode is at the dorsal region and the anode at the lumbar region. It is of the greatest importance to exclude the dog's head from the circuit. The electrode is composed of a zinc plate, covered or not with chamois, but always covered with a thick layer of absorbent cotton, wet with a saline solution 7 per 1000. The electrodes used for dogs of large size measure 12 by 25 cts.

Various electric currents are prepared and ready for utilization before the chloroforming is begun: the alternating current and the continuous currents, usually of 110 volts (city current), the continuous current supplied by storage batteries of high capacity (200 amperes), a current of frequent interruption (from 6,000 to 12,000 per minute, period 1/10), induction current furnished by a coil especially made according to our indications; the diameter of the wire is not under 0.6 mm. (2).

In the application of electric currents that have differentiated poles, the cathode should be dorsal and the anode lumbar.

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2. Dr. Louise G. Robinovitch.—I. De l'emploi des courants éléctriques pour le rappel à la vie, dans les cas de mort apparente causée par le chloroforme ou par l'éléctrocution: Nécessité d'exclure du circuit la tête,

As soon as the chloroforming is sufficiently far advanced, so that the arterial blood pressure is low and the respiration slow, the animal approaching apparent death, the anterior paws are untied and the head set free; the tip of the tongue is clasped with a pair of forceps and the saliva and mucus in the mouth and throat are rapidly cleansed with absorbent cotton held with a pair of long pincers.

The conducting wire of the cathode is now connected with the switch in the circuit of the current to be utilized and the conducting wire of the anode is connected with the potential reducer; by means of the latter the operator manipulates the voltage, increasing or diminishing it; and the switch enables the operator to open or close the circuit with facility.

As soon as apparent death takes place, with arrested blood pressure and respiration, synchronous or not, the operator opens the animal's mouth so as to allow free access of air; this may be continued during a period of from a few seconds to one minute; if there are no signs of returning life, the operator commences to practice rhythmic electric excitations with the chosen current, say a current of low tension and frequent interruption (from 6,000 to 12,000 per minute, period of the passage of the current 1/10 of the entire time).

The first rhythmic excitations are produced with the minimum voltage necessary to cause maximum inspirations, generally from 15 to 20 volts.

An assistant keeps the animal's mouth open; the operator holds the animal's tongue with one hand, by means of a tongue forceps, and with the other he manipulates the switch.

The first closure of the circuit, lasting from ¼ to ½ of a second, causes an energetic artificial inspiration: the lifeless, flabby tongue is contracted and drawn into the mouth, the anterior paws are thrown upward and forward with great force (the animal is on its back), the chest is markedly distended, the diaphragm is pushed downward, the posterior paws are extended and all the respiratory organs and muscles enter into play.

While these artificial phenomena of respiration take place, the

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pendant les excitations rythmiques (Expérience pratiquée sur le chien. Application clinique). II. Anesthésie éléctrique (Application clinique; présentation de malades). III. Présentation d'instruments, *Bulletin de la société clinique de médecine mentale,* November, 1908.

Since the presentation of this paper at the Société clinique de médecine mentale, Paris, November, 1908, we have constructed an instrument giving from 25,000 to 30,000 interruptions per minute (see description of instruments in this issue).

heart also reacts from the beginning—in the less grave cases; but in cases of profound syncope the heart does not react at once; if this is the case, the voltage should be increased without delay, from 15 to 20 or 25 volts; the rhythmic interruptions of the circuit should continue while the voltage is being increased; the rupture of the circuit should last from 1 to 1½ or 2 seconds, according to the gravity of the case and the respiratory and cardiac reactions.

The breaking of the circuit causes a marked artificial expiration: the anterior paws extended in the air suddenly fall one on each side of the animal's body while an expiratory chest movement takes place; this fall of the paws is marked and causes a sort of a double expiratory movement that is sometimes registered in the traces that we have the honor of presenting to you to-day. The tongue and all the other respiratory muscles are once more lifeless and flabby.

After the artificial expiration the animal's body remains inert, flabby, without spontaneous respiration or cardiac beats. The operator pulls the animal's tongue outward so as to allow free access of air during the succeeding artificial inspiration.

The voltage is now increased, if necessary, and the circuit is again closed as above, then opened, as indicated. If the heart commences to beat artificially after a few rhythmic excitations have been practiced, the same voltage is maintained as long as the amplitude of the wave of the artificial blood pressure seems to be satisfactory; but as soon as this amplitude shows any decrease, the potential is augmented to 30 volts, to 35, or even 40 volts, if necessary; the rhythmic excitations are continued with this voltage, closely watching the amplitude of the respiratory curve and that of the blood pressure; after a certain period of rhythmic excitations, say from a few seconds to one minute, the artificial cardiac reaction should become more and more vigorous; if this is not the case, the potential is increased to 50, 60 and 70 volts. There should be a minimum delay in causing artificial cardiac reaction; the artificial respiratory reaction is always obtained in the beginning but the artificial respiration is useless without its being accompanied by artificial heart beats. And the more the artificial heart beat is vigorous, the more chance is there of spontaneous heart beat taking place. The spontaneous heart beat may take place at any time during the rhythmic excitations—before or after the onset of spontaneous respiration. After the excitations have been practiced from 30 seconds to one or two minutes, a feeble spontaneous respiratory movement takes place; the latter

may precede or follow the first feeble spontaneous blood pressure, as you may see from the traces Nos. 3, 4 and 5.

In ordinary cases in which the syncope is not grave, the dog may revive after the first spontaneous respiration—the spontaneous heart beats being re-established—without continuing the rhythmic excitations; but in the large majority of grave cases, it is absolutely necessary to help the animal both in his respiration and in his cardiac function—by alternating the feeble spontaneous respiration and blood pressure with ample artificial respiration and blood pressure until both functions are permanently re-established.

It should be borne in mind that in chloroform poisoning, in ether poisoning, in electrocution, in drowning, in hanging, etc., the blood is asphyxiated—dark; therefore, it is not sufficient to cause feeble respiratory movements and feeble heart beats such as are obtained with the Sylvestre and Laborde methods; it is imperative to oxygenate the blood—by practicing ample artificial respiratory movements—and by sending oxygenated blood into the circulation by causing artificial heart beats—that propel oxygenated blood. The reason that surgeons often fail to revive definitely patients in a condition of apparent death caused by chloroform is as follows: the Sylvestre and Laborde methods generally used cause only feeble artificial respirations—with insufficient oxygenation of the blood; even in cases of success, when the heart beats are re-established, life is not permanently restored because the bulbar respiratory and cardiac centers are definitely asphyxiated through insufficient oxygenation.

An example of the alternation of feeble spontaneous blood pressure and respiration with artificial ample blood pressure and respiration is registered in trace No. 5.

The artificial blood pressure and respirations should never encroach on the spontaneous blood pressure and respiration, especially when the latter are feeble; the operator risks causing instantly the animal's death by such an encroachment. We have had several cases of this kind. The blood is asphyxiated, dark, in dogs in a condition of chloroform syncope; for this reason, in cases of grave syncope, artificial respiration alone is useless without being accompanied by blood pressure. On the other hand, artificial respirations obtained with Sylvestre's method or by means of rhythmic traction of the tongue never present the amplitude of those caused by electric currents.

In one case of grave cardiac syncope we have tried a method of resuscitation in imitation of that generally applied in surgical emergencies; that is to say, instead of causing, by means of elec-

tric currents, artificial ample respiratory movements and heart beats, as may be practiced by using gradually increasing voltage, we limited ourselves to the use of a small potential of 8 volts during the entire period of the respiratory and cardiac syncope. The result of this experiment is registered in trace No. 1.

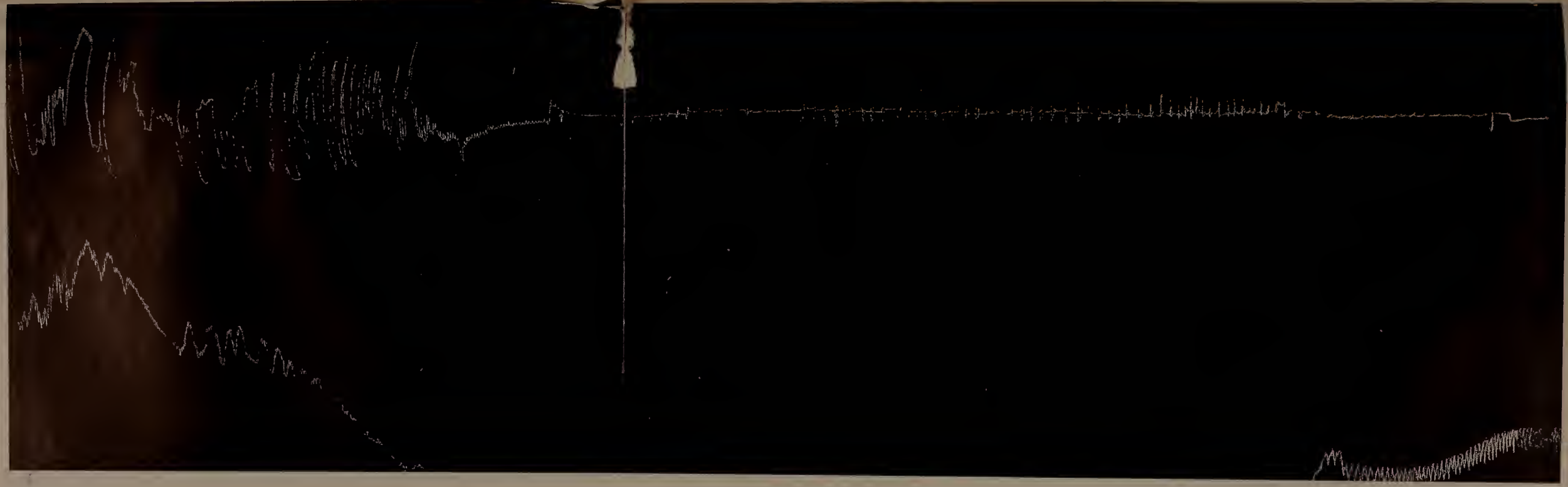
The experiment registered in trace No. 1 was performed on a dog. After a certain period of chloroforming the blood pressure (registered by François-Franck's manometer, simple type) was between 16 and 17 centimeters of mercury, and the respirations, after a period of marked irregularity, became rapid and frequent. Then, in the course of 5 seconds, there was an abrupt fall of the blood pressure in the carotid artery,—down to the absciss. Arrest of the heart beat preceded that of the respiration. The cardiac paralysis was followed by a grave disturbance of respiration: the amplitude of the respiratory curves was abruptly decreased, then became small—almost imperceptible—and then there was a definite arrest of respiration, as you may see from the registration in the trace.

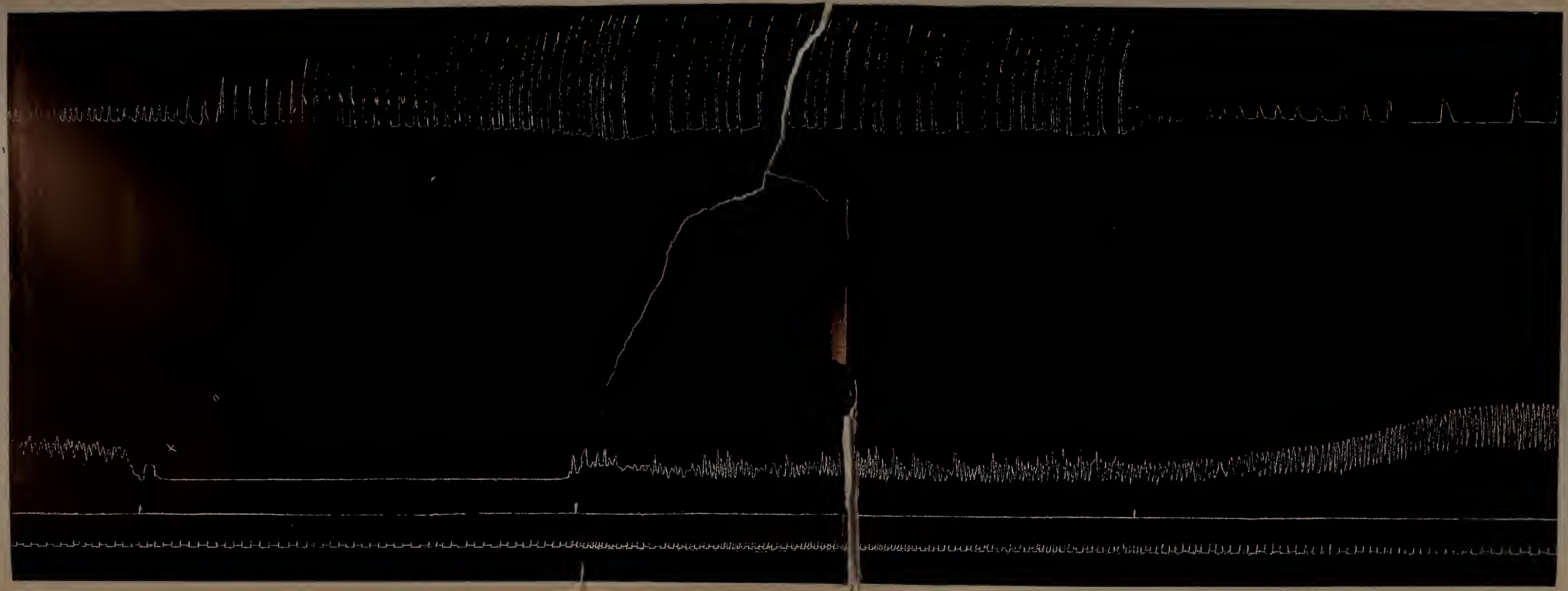
The rhythmic excitations were begun about 40 seconds after the last registered cardiac contraction and 15 seconds after the arrest of respiration.

The rhythmic excitations were practiced in imitation of the method used in rhythmic traction of the tongue, rhythmic contraction of the chest, Sylvestre's method, etc.; that is to say, small rhythmic respirations were caused to take place by means of an electric current of 8 volts (current of frequent interruption, period 1/10); the excitations were made every ⅓ or ½ second, repeated every 1 to 3 seconds.

These respirations of minimal amplitude were not followed immediately by spontaneous respiration, nor was there artificial or spontaneous blood pressure; there was no sign of any heart action during a period of two minutes; this period is indicated by a straight line in the trace. After this period the heart began to beat spontaneously, but spontaneous respiration did not reappear. The amplitude of the cardiac curves increased gradually and there seemed to be hope of resuscitation: the artificial respirations were too feeble to allow useful oxygenation of the blood to take place. The animal died, then, as one dies from ordinary asphyxiation—from arrest of respiration followed by arrest of the heart beats.

The animal could have been resuscitated with the method that we have the honor of presenting to you to-day: with our method we can not only regulate the amplitude of the respiratory curve





THE JOURNAL OF MENTAL PATHOLOGY, Vol. VIII, No. 4, 1909.
Illustrating Dr. Robinovitch's Paper.

TRACE No. 2.—S, cardiac syncope; E, rhythmic excitations with an induction current; voltage increased gradually from 10 to 0 of the scale (Dubois-Reymond apparatus, coil No. 2); R, first spontaneous respiration.

but artificial heart beats may also be caused to take place,—as you may see in traces Nos. 2, 3, 4 and 5.

Indeed, in trace No. 2, of December 7, 1907, is registered the experiment performed on a dog, weighing 12 kilograms; apparent death was caused by excessive chloroforming. Cardiac syncope preceded respiratory syncope and was quite as grave in nature as was that registered in trace No. 1. Cardiac syncope set in gradually, then there was complete cardiac paralysis that lasted 52 seconds, as is indicated in the trace.

The rhythmic excitations were begun after fall of blood pressure and complete cardiac arrest; the electric current used was an induction current, Dubois-Reymond's apparatus, coil No. 2 (medium between 1 and 3). As the cardiac syncope was of a grave nature, we tried to obtain—first artificial then spontaneous cardiac beats—as well as spontaneous respiration—with as little delay as possible. With this end in view economy of time was of utmost importance; therefore, the potential was increased progressively but rapidly by displacing the coil from 10 to 0 centimeters of the scale while the rhythmic excitations were being produced.

Cardiac beats commenced 52 seconds after the first rhythmic excitation and the first spontaneous respiration took place after the excitations had been practiced for 3 minutes and 20 seconds. The animal was resuscitated.

The same animal was chloroformed three times in the same afternoon, and every time was put in a condition of apparent death; and every time resuscitation was complete.

The study of traces Nos. 1 and 2 is convincing in favor of our method of resuscitation.

In trace No. 3, of November, 1907, is registered an experiment on sudden respiratory syncope caused by intensive chloroforming in a dog weighing 19 kilograms. The amplitude of the respiratory wave immediately preceding the respiratory syncope is satisfactory, and therefore the onset of the syncope is unexpected. The syncope lasted 57 seconds before the rhythmic excitations had been commenced. These excitations were caused with an electric current of 24 volts, 6,000 interruptions per minute, period 1/10. Each ample artificial respiration is accompanied by an accentuated cardiac beat.

Blood pressure was maintained during the entire period of respiratory syncope, but the syncope was of a grave nature—because it was necessary to practice artificial respiration during a period of one minute before spontaneous respiration set in. Resuscitation was complete; the animal was submitted a second

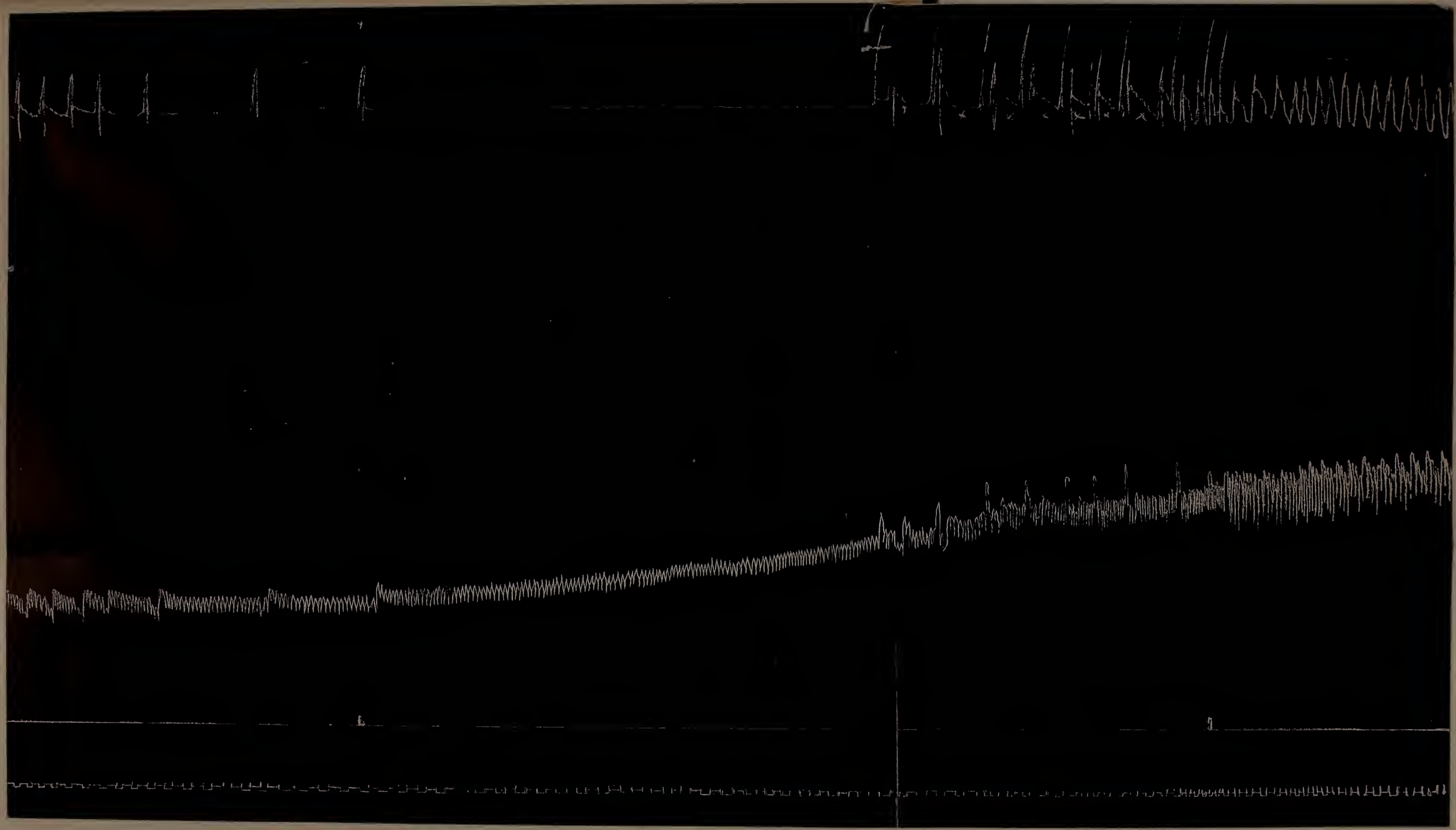
time to chloroform syncope; this syncope lasted one minute, and the second resuscitation was also complete.

The gravest cases of chloroform syncope are those in which the amplitude of the respiratory wave and the blood pressure—immediately preceding the onset of syncope—is normal or even more marked than normal: the sudden onset of syncope takes place without any warning. From the surgical standpoint, such cases are the most difficult ones to handle,—because of the unexpectedness of the accident; and the ordinary means of resuscitation at the surgeon's disposal are useless. It is in these cases particularly that the electric method of resuscitation is of the utmost utility. Such a case is regisered in trace No. 4. The experiment was performed on a shepherd dog (female), weighing 14 kilograms.

The curve of the respiratory movements and of blood pressure in the carotid artery was in perfect proportion, when suddenly, without any warning, respiratory and cardiac syncope set in synchronously, as you may see in trace No. 4. We waited twenty seconds but there was no sign of life in the animal; rhythmic excitations were then practiced with an electric current of 20 volts (6,000 to 12,000 interruptions, period 1/10).

In this trace you can easily see the registered artificial blood pressure—following each artificial respiration—caused by the rhythmic excitations. After a certain length of time, and while the excitations are still being practiced, a spontaneous element appears in the blood pressure, as you may see in the trace before you. The first spontaneous respiration appeared after a period of rhythmic excitations that lasted two minutes and 48 seconds, the current used was as explained—20 volts. The syncope was of grave nature, and it was with great difficulty that we succeeded in resuscitating the animal. The minimal amplitude of the spontaneous respirations indicates the gravity of the syncope that preceded.

After the experiment we tied the right carotid artery preparing to close the wound and to put the animal on its paws again. By accident, the carotid artery was severed at the cardiac end—beyond the ligature, and the profuse hemorrhage that followed made it impossible for us to find the cardiac end of the artery that had receded behind the clavicle (the connective tissue around the artery had previously been thoroughly dissected for a special purpose and the artery was disconnected from the pneumogastric nerve down to the clavicle). The animal bled until apparent death set in—there being neither respiration nor blood pressure: the animal lay lifeless, the bleeding had ceased completely and the



The Journal of Mental Pathology, Vol. VIII, No. 4, 1909.
Illustrating Dr. Robinovitch's Paper.

Trace No. 3.—Respiratory syncope. S, commencement of the syncope; E, commencement of rhythmic excitations; R, commencement of spontaneous respirations.

gums, tongue and conjunctiva were bloodless. We now had no difficulty in finding the severed end of the artery by following the course of the pneumogastric nerve down to the clavicle. The artery was now tied and the animal remained in a condition of apparent death—without respiration or cardiac beats. We had no hope of saving the animal, but a sheer experimental whim made us try to revive the dog; we supposed for a moment that the animal represented one of our patients, who, often enough are brought in with severed vessels in their necks—self inflicted during an attempt at suicide. With this thought in mind and without any hope of success we commenced to practice rhythmic excitations as we had previously done on the same animal. To our great surprise the animal showed a very feeble spontaneous inspiration. We continued the rhythmic excitations: there was no sign of any blood pressure (cardiac beats), the pauses between the minimal spontaneous respirations were long, and death seemed to be imminent. But we kept up the practice of the rhythmic excitations, and to our great surprise resuscitation was complete after a period of 5 minutes since the first spontaneous respiration took place.

This is the first experiment, we think, in which resuscitation was practiced by means of our method in a case of grave hemorrhage from a vital artery.

During the week following this accident, the animal was in a deplorable physical condition, and death seemed to be imminent at any time; nevertheless, the great care and milk diet enabled the animal to get stronger, although we did not make any injection of serum or blood. August 14, 1908, the dog was sufficiently recovered to be subjected to a second experiment on chloroform syncope. Trace No. 5 presents this second experiment, and is most instructive from the standpoint of resuscitation. The blood pressure was taken in the left femoral artery, with Marey's manometer.

There are certain points of importance in this experiment and they are cited below:

1. Cardiac syncope preceding respiratory syncope.
2. Alternation of artificial and spontaneous respirations.
3. Artificial cardiac reaction following each artificial respiration.
4. Second respiratory syncope—after resuscitation. Rhythmic excitations resumed and second resuscitation established.
5. Comparative effect of excitation with the cathode in thoracic and in the precordial region respectively.

Necessity—after the second respiratory syncope—of augment-

ing the voltage rapidly and repeatedly until resuscitation is obtained.

The above combination of unusual circumstances during chloroform syncope is rare and most interesting as well as instructive.

The cardiac syncope lasted 20 seconds before the rhythmic excitations had been commenced (20 volts, current interrupted 6,000 to 12,000 times per minute, period 1/10). Three excitations were made with this voltage, but the cardiac reaction was too feeble; there was a pause while the voltage was being augmented, and the heart was at a stand-still during that pause; excitations were now made with 30 volts; this voltage caused good respiratory movements as well as ample artificial cardiac reaction. But as soon as the artificial respiration was stopped, the cardiac reaction was also abolished. The excitations were continued during a period of 1 minute and 49 seconds; at the end of this time a spontaneous respiration took place and was repeated four times; the cardiac reaction also showed a spontaneous element; the rhythmic excitations were stopped, and the spontaneous respiration also stopped for the second time. The excitations were resumed with 30 volts, and continued with 50, then 58 volts during a period of 10 seconds; spontaneous respiration reappeared but its amplitude was small; then, without delay, the small spontaneous respirations are alternated with ample artificial respirations; spontaneous respiration was then definitely re-established; the wound was closed and the animal put on its paws again. In two weeks the dog was completely recovered. And to-day, November 25, 1908, the animal is in perfect physical condition and we present it to you for inspection.

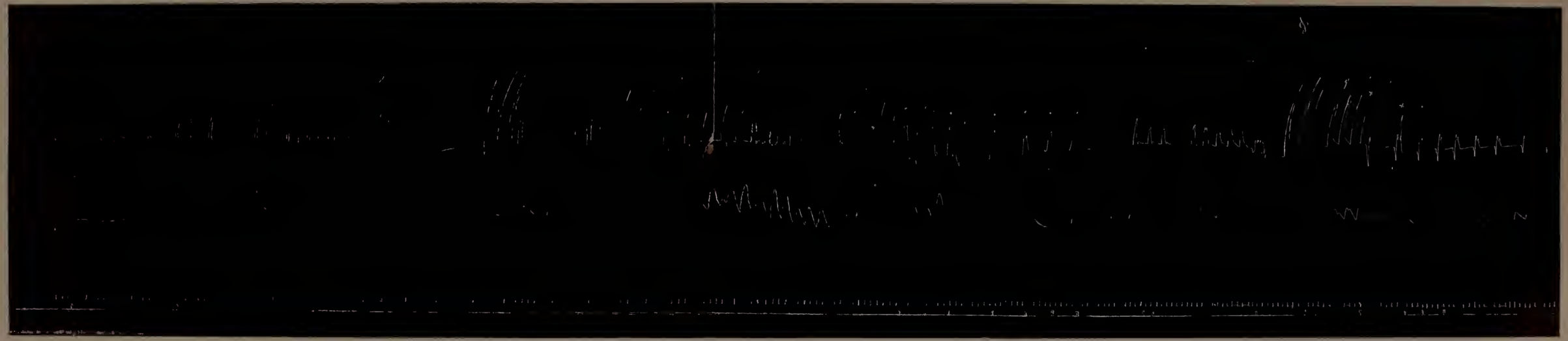
In this experiment the reactions obtained with the cathode on the precordial region were inferior to those obtained with the cathode applied at the dorsal region; anatomically and physiologically—the fact should be as it is.

Our five traces show that the term "chloroform syncope" is a vague expression, because there are not two cases of this syncope that are alike even in the same animal.

And the comparison of the ordinary methods of resuscitation with our method shows the advantage that our method presents.

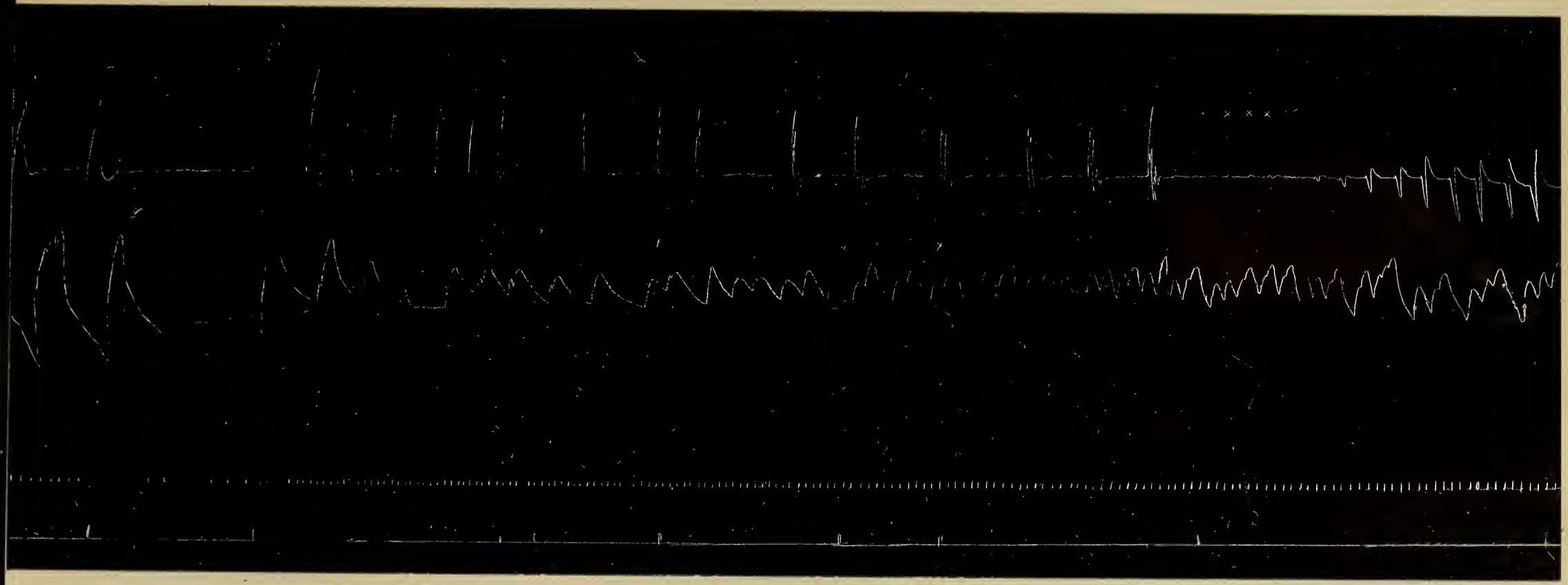
In one of our works that is being prepared for publication we reproduce on a larger scale the traces relating to the study in question and also cases of chloroform syncope that had lasted from 4 to 5 minutes and in which resuscitation was complete in spite of this long duration.

The application of our method is easy and practical: before a surgical operation is begun the two electrodes should be placed



Trace No. 5.—Cardiac syncope preceding respiratory syncope. C, cardiac syncope; A, first rhythmic excitations with 20 volts (direct current interrupted 6 to 12,000 times per minute, period 1/10); B, excitations with 30 volts; C, excitations with 40 volts; D, rhythmic excitations with 50 volts; E, rhythmic excitations with 58 volts; R, first four spontaneous respirations; S, second respiratory syncope; Q, rhythmic excitations with 50 to 58 volts, the cathode being applied over the precordial region; U, a spontaneous respiration; V, rhythmic excitations with same voltage, but cathode in the dorsal region; XXX, spontaneous respirations followed by resuscitation.

surgical operation is begun the two electrodes should be placed



Trace No. 4.—S, synchronous cardiac and respiratory syncope; E, rhythmic excitations followed by artificial cardiac and respiratory movements; the small curves in the traces of the artificial heart beats indicate feeble spontaneous heart beats; XXX, first spontaneous respiratory movements.

under the patient, in their respective regions, the conducting wires adjusted and the electric source should be ready for use in case of syncope caused by chloroforming.

The preferred current is the one of low tension and frequent interruption; our second choice is an induction current of sufficient voltage and intensity, obtained with our model of coil made for this purpose.

The wire of this coil should have a diameter not under 6/10 mm.; it is dangerous to use wire of smaller diameter. For details of the construction of the apparatus see our paper entitled "An Induction Coil Specially Constructed for Resuscitation of Subjects in a Condition of Syncope Caused by Chloroform."

It is of the utmost importance to exclude the animal's or the patient's head from the circuit during the rhythmic excitations. We have indicated elsewhere (3), and we repeat, that among others, the cerebral and bulbar blood vessels contract at every closure of the circuit. This special condition is unfavorable for the re-establishment of function of the respiratory and cardiac centers in the medulla oblongata; therefore, exclude the head from the circuit.

It is important to employ the minimal voltage possible for the production of the most ample respiratory and cardiac reactions. The current may vary between 10 and 70 volts, for dogs without reference to size. With higher voltage we have never succeeded in resuscitating dogs.

In normal man we have obtained good respiratory reaction with a current of low tension and frequent interruption—using 20 to 90 volts. The amperage cannot be measured in these cases on account of the rapid closure and opening of the circuit.

For human beings we use electrodes measuring 25 by 30 cts. for the dorsal region and 12 by 25 cts. for the lumbar region.

Various electric currents may be used (4): the alternating (the worst and its use should be avoided), continuous, induction current and the current of low tension and frequent interruption; the current of high frequency has given us negative results. We insist on the danger of using the alternating current that is fatal

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3. Dr. Louise G. Robinovitch.—Methods of Resuscitating Electrocuted Animals. Different Effects of Various Electric Currents According to Method Used. Importance of Excluding from the Circuit the Central Nervous System During Resuscitation, *The Journal of Mental Pathology*, Vol. VIII, No. 3, 1907.

4. Dr. Robinovitch.—Methods of Resuscitating Electrocated Animals. Different Effects of Various Electric Currents According to Method Used. Importance of Excluding from the Circuit the Central Nervous System During Resuscitation, also: Different Effects of Various Electric Currents (in this issue).

to cellular life. The continuous current may be used, but it is better to substitute for it a current less dangerous to cellular life. The induction current furnished by a large coil made specially according to our indications for this purpose gives satisfactory results. Our preferred current is the one of low tension and frequent interruption (5).

The application of the cathode in the thoracic (dorsal) region gives better results than in the precordial region.

Our method can be used for resuscitating drowned subjects, subjects in a condition of apparent death caused by angina pectoris (non-obstructive), etc. Our method is especially applicable in cases of apparent death caused by electrocution. Our method of resuscitating subjects in chloroform syncope is the result of our researches into resuscitation of electrocuted subjects (6). What we have indicated for the former applies equally to the latter.

The first physiologic researches into the mode of death by electrocution and into the mode of resuscitation were made by Professor Batteli; an abstract of his paper is published under the title of "Fulguration" in Richet's Dictionary of Physiology, 1900. Resuscitation is attempted with a single shock of 4,800 volts of an alternating current—during a fraction of a second. This excitation must be made before the fall of the blood pressure to the absciss; unfortunately the author does not succeed in resuscitating his subjects when applying such severe shocks after the descent of the blood pressure to the absciss; his results are often fatal even when the shock is applied before the arrest of blood pressure. This fact is easily explained, because this mode of resuscitation is not only dangerous for the subject electrocuted, but it also is a hazardous means; resuscitation must take place with one or at the utmost with two excitations with this high voltage; in case of failure, repetition of such excitations would be fatal to life.

If Dr. Battelli's method is not useful from the practical point of view, his studies are interesting from the physiologic point of view as first experiments.

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5. Since the presentation of this paper, in November, 1908, we have constructed a new instrument for frequent interruptions—from 25,000 to 30,000 per minute (see description of instruments in this issue).

6. Dr. Louise G. Robinovitch.—Methods of Resuscitating Electrocuted Animals. Different Effects of Various Electric Currents According to Method Used. Importance of Excluding from the Circuit the Central Nervous System During Resuscitation, *The Journal of Mental Pathology*, Vol. VIII, No. 3, 1907.

The eminent physiologist of Nantes, France, Professor Rouxeau, followed up the question with his valuable physiologic studies of the mode of death and of resuscitation in electrocution; he published his researches jointly with Prof. Leduc (7); their method of resuscitation is more practical: the cathode is applied to the forehead and the anode to the abdomen; the rhythmic excitations are made with the lethal current, and, besides, the current used is favorable (current of low tension and frequent interruption, period 1/10). This method gives good results in rabbits, but not in dogs (8). We were the first to find the means of practical value by which electrocuted dogs may be resuscitated (the dog's heart is highly sensitive and its vitality is easily killed with electrc currents). We were the first to show the necessity of excluding from the circuit the animal's head during the rhythmic excitations; we were also the first to show the necessity of using the minimal possible voltage for causing the maximum possible respiratory and cardiac reactions immediately following apparent death, and of increasing the voltage progressively with the continuation of the resuscitation: apparent death may continue for a period of some minutes, and we have been the first to point out the danger of exhausting the cardiac excitability in the beginning of the rhythmic excitations—by using high voltage to produce them.

It is important to bear in mind that electrocution caused with any current,—continuous, alternating, induction or that of low tension and frequent interruption,—produces asphyxia and cardiac paralysis. A few seconds after the passage of the lethal current the blood becomes asphyxiated and it appears dark in the large vessels where it can be seen. This asphyxia of the blood persists a long time after resuscitation. Thus, we electrocuted a shepherd dog and we resuscitated it. An hour after we subjected the animal to an experiment necessitating opening of the carotid artery; while doing so, the arterial blood appeared dark—venous—asphyxiated.

From the practical point of view, our method is especially applicable in man in cases of accidental electrocution, particularly in electric power houses where connection with current can easily be

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7. MM. Leduc and Rouxeau.—L'inhibition respiratoires par les courants intermittents de basse tension: *Société de Biologie,* July 4, 1903.

8. Dr. Louise G. Robinovitch.—Methods of Resuscitating Electrocuted Animals, etc.; General and Cerebral Blood Pressure During an Attack of Electric Epilepsy, etc.; Methods of Resuscitating Animals in a Condition of Respiratory and Cardiac Syncope Caused by Chloroform, etc. *The Journal of Mental Pathology,* Vol. VIII, No. 3, 1907.

made. In case of accidental electrocution, the cathode should be applied on the back—the upper border reaching just below the root of the neck; and the anode over the lumbar region; rhythmic excitations should then be made with the lowest possible potential that will cause good respiratory and cardiac reaction; this should be continued until ample spontaneous cardiac and respiratory movements are established.

In accidental electrocutions death is seldom immediate; contact with the live wire is generally made by touching it with the hand or the foot; consequently, the electric shock is seldom as marked as it is in cases of laboratory electrocutions. In the majority of cases of accidental electrocution the patient continues to breathe for a period of from a few minutes to one-half hour after the accident,—when death takes place by respiratory and cardiac paralysis. Therefore, there is the utmost necessity that the physician practice on his patient artificial respirations and cardiac beats immediately and not allow death to set in while the patient's respiratory and cardiac centers are being gradually but surely asphyxiated.

For emergency in power houses or in any place where an accidental electrocution may take place, we have constructed a special coil that gives a sufficiently strong current for practicing rhythmic excitations. The diameter of the wire of this coil should not be below 6/10 mm. Where it is practicable to do so, the use of the current of low tension and frequent interruption is much to be preferred (9).

Application in Man.—We were the first to apply in man rhythmic excitations caused with the current of low tension and frequent interruption. Our patient, a man, chronic alcoholist, was under our treatment for hemianesthesia of many years' duration; he had been an inmate at the Ste.-Anne Asylum, Paris, at various times during the last twenty years. In this patient we obtained excellent respiratory reactions with the current of low tension and frequent interruption, using 20 to 90 volts. These shocks were not painful; on the contrary, the patient was amused by the rhythmic and involuntary reactions.

There is every indication for the use of electric currents in cases of apparent death. Indeed, we have had occasion to make such

9. Since the presentation of this paper at the Société clinique de Médecine Mentale, Paris, November, 1908, we have constructed a new instrument for frequent interruptions of the continuous current, giving from 25,000 to 30,000 interruptions per minute (see description of the instrument in this issue).

use of an induction current in man with happy results; we shall relate the case elsewhere.

The cathode should always be at the dorsal and the anode at the lumbar region.

We have two terminals in our electrodes; the conducting wire is bifurcated, and each branch of the wire is screwed into the corresponding terminal of the electrode. This is done as a matter of precaution: for unaccountable reasons, it often happens that the conducting wire is unscrewed and separated from the electrode during the operation. In case of apparent death in man, an accidental delay of this kind is avoided by using a bifurcated conducting wire. We have never had both ends of the wire accidentally disconnected from the electrode.

ELECTRIC ANESTHESIA IN LABORATORY SURGERY SUCCESSFULLY APPLIED DURING A PERIOD OF THREE YEARS. DEMONSTRATION ON AN ANIMAL, AND CLINICAL APPLICATION (Presentation of patients).

(From Dr. Magnan's Laboratory, Ste.-Anne Asylum, Paris, Directed by Dr. Louise G. Robinovitch.)

By Louise G. Robinovitch, B. ès L., M.D.,
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In 1906 we were the first to apply electric anesthesia in laboratory surgery (1); we have continued up to date the substitution of electric anesthesia for chloroform and ether anesthesia in all

1. Dr. Louise G. Robinovitch.—Electric Sleep. An Experimental Study of an Electric Current of Low Tension. Illustrated with Cardiac and Respiratory Tracings. A Preliminary Communication. *The Journal of Mental Pathology,* Vol. VII, No. 4, 1905.

our laboratory surgery. The method of application and the interrupter described in our thesis (2) and in other papers has since been modified by us. The most important modification lies in the construction of the interrupter through which the electric current passes. We have been obliged to change every detail in the instrument directly connected with the interruption of the current in order to insure safety in the application of this form of anesthesia. The instrument is described in another paper entitled Motor-Interrupter Supplying a Current of Frequent Interruption for Electric Anesthesia (3).

We have also increased the number of interruptions from 6,000 to 12,000 per minute; we use preferably 8,000 interruptions per minute; the course is maintained as even as possible, by means of a rheostat in the circuit; and the two contacts at the commutator we have rendered as flexible as possible, so as to do away with sudden jars while the animal is in the circuit. All our modifications have been made step by step, as we noted the imperfections of the electric anesthesia obtained with the old interrupter first constructed by Profs. Leduc and Rouxeau.

We still find 1/10 period convenient with 8,000 interruptions per minute. The cathode is applied at the head and the anode at the lumbar region. The electrodes are made of zinc, covered or not with chamois, but always covered with a thick layer of absorbent cotton wet with a salt solution 7 per 1,000. The cathode should be large enough to cover the forehead.

The continuous current is interrupted at the negative pole; and we repeat that the cathode should be at the head (see our thesis cited above, pp. 34 to 39, on the danger of applying the anode at the head).

The circuit is closed at *o* volts; the voltage is then gradually increased by manipulating the handle of the potential reducer;

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2. Electric Anesthesia or Electric Sleep: *Reference Handbook of Medical Sciences,* Wm. Wood and Co., 1907.

Electric Anesthesia in Laboratory Work, *The Journal of Mental Pathology,* Vol. VIII, No. 3, 1907.

Anesthésie éléctrique (application clinique; présentation de malades), *Bulletin de la société clinique de médecine mentale,* November, 1908.

Sommeil éléctrique, épilepsie éléctrique et éléctrocution. *Thèse de Paris,* 1906.

3. Since the presentation of this paper at the Paris Société clinique de médecine mentale, November, 1908, we have constructed a new instrument, with which more rapid interruptions are obtained—from 25,000 to 30,000 per minute. The cost of this new instrument is considerably below that of the instrument described (see description of our new instrument in this issue).

while doing this the operator pays particular attention to the voltage and amperage. A dog can be anesthetized with from 5 to 10 volts, the milliamperage ranging between 1.5 to 2 mA. The resistance of a dog is between 300 and 500 ohms, according to the animal and—the size of the electrodes used.

At the beginning of the passage of the current the animal is uneasy; as the current is being increased the animal becomes agitated and tries to free itself; the current is then increased a bit more and electric anesthesia follows instantly; the animal falls on its side and remains quiet. If the anesthesia is kept up for a long time, it is necessary to gradually decrease the voltage—the smallest fraction of a volt at a time; during such anesthesia the animal keeps its eyes wide open and is apt to lift its head at various intervals, for a second or two; the animal may even make an effort to raise itself, but immediately falls back on its side and remains quiet again. Consciousness is not completely abolished.

The eyes are always open during electric anesthesia, the cutaneous reflexes are considerably exaggerated; the sense of touch is blunted but not abolished. Sensibility to pain is markedly reduced but not completely abolished. Regardless of this, the dog, of all animals used in laboratory work the most sensitive to pain, stands well the most painful operations under this anesthetic, such as exposing the carotid artery, the femoral artery, trephining of the skull, abdominal operations, etc. In our experience extending over a period of three years, we have not had any untoward accident attributable to this anesthesia. Immediately after the operation the animal walks about and shows no after effects, as you may see from the actions of the animal on which I have operated before you.

It should be borne in mind that electric anesthesia causes abortion in pregnant animals; the abortion may take place on the same day or the day following the electrization. If the animal has milk in its breasts, the milk is projected with force at the beginning of the electrization.

At the beginning of the anesthesia there is evacuation of the bowels and of the bladder.

We repeat the caution we have presented in our paper on electric anesthesia, published in the *Reference Handbook of Medical Sciences,* Wood & Co., 1907: No physician should undertake to practice electric anesthesia on man without having had two years' daily experience in this work. It is not difficult to practice the anesthesia; on the contrary, everything connected with it is as simple as can be. But the proper manipulation of the voltage and amperage together with the correct understanding of the respira-

tion and pulse of the subject in the circuit may be expected of none but of the physician who has had at least two years' daily experience in the work.

We feel a great responsibility in presenting the good results obtained in our work and for the following reason: an excellent colleague, a thorough electrician and surgeon became enthused with our work, repeated our experiments a few times, and considered himself sufficiently prepared to demonstrate the operation to a large gathering of professional men at one of the leading universities in Europe. The animal chosen was a rabbit; it was put into the circuit, the voltage turned on, and—electrocution—instead of anesthesia was the result.

Such a result seems incomprehensible to us, for we have presented in our thesis and in all our papers on this subject the possible dangers that should be avoided. Yet the animal was electrocuted—when it was most desired only to anesthetise it. The potential used—by mistake—was some 70 volts—instead of 5 to 8 volts. In case of a man the mishap would have been most serious. Had our colleague been familiar with the normal respiration and pulse of a rabbit in the circuit of a current intended for anesthesia, he would have recognized his mistake at once; he would have turned off the current immediately, and no harm would have been done, except for a momentary electric shock with some 70 volts—that is never of any importance—if it lasts only a second or two. But such a current is dangerous if left to course through a living animal indefinitely. We have repeatedly demonstrated the impossibility,—in our hands,—of even shocking an animal during electric anesthesia; with the animal in the circuit, we have shown repeatedly that after the anesthetic dose has been reached, with 5 or 10 volts, the slightest increase of this dose,—even to the extent of a fraction of a volt, excites the animal; the experienced operator utilizes this peculiarity as a guide in the increase or decrease of the potential. The only way in which an operator can succeed in killing an animal during electric anesthesia, is for him to disregard the animal's agitation while he increases the voltage, then to disregard the animal's convulsions as he still continues to increase the voltage twice, five and ten times the normal dose,—until electrocution takes place. Such a thing seems preposterous, and yet it has been done by an excellent electrician and surgeon—before a learned audience. It is not superfluous, therefore, for us to repeat, that no physician should attempt to practice this anesthesia on man, unless this physician has had two years' daily experience in this work on animals.

To avoid all possible accidental shock, the physician should

know that the voltage and amperage necessary to induce anesthesia is quite limited in range; the resistance of man and dog,—when electrodes of dimensions indicated by us are used,—is about 300 ohms. In dogs,—from 5 to 10 volts, showing from 1.5 to 2 milliamperes, cause anesthesia. The resistance varies in animals; but it does not vary so much that it should become necessary to use a current strong enough to electrocute the subject. Electrocution, in these circumstances, is the result of some grave mistake; a man who commits such a mistake on animals should put in two years in daily practice of this work, before attempting such anesthesia on man.

One more word of caution: before attempting the practice of electric anesthesia on man, the physician should be thoroughly familiar with our method of resuscitation. In the hands of a practiced operator an accidental electrocution (although unpardonable) as is the one related, is of no importance, because a slight shock of short duration is not dangerous if resuscitation is immediately attempted. We have experimentally repeated our colleague's mishap—shocking the animal to death—as he had done accidentally, and bringing it back to life—as he had not done. We have never lost an animal in this series of experiments.

While urging the necessity of caution, we have no hesitation in recommending electric anesthesia as an excellent substitute for ether and chloroform.

Contra-Indication.—Centrally, electric anesthesia should not be applied in the old, in subjects affected with arterio-sclerosis or in patients subject to epileptic, apoplectiform or apoplectic attacks. The effect of the current is to heighten the blood pressure (see our thesis cited above.)

The duration of electric anesthesia may be prolonged for many hours without any danger to the patient. In our thesis already cited we present an experiment in which an animal was kept under the influence of this anesthesia for a period of eight hours and twenty minutes. The temperature and respiration remained normal during the whole period (see pp. 32-33).

Central anesthesia in man may be produced with from 37 to 40 or more volts of the current described. In the hands of a practiced physiologist thoroughly familiar with the respiration and blood pressure of the subject in the circuit there is perfect safety in the operation.

Local Anesthesia.—In 1906 we practiced local anesthesia on our own arm, using 25 volts; the amperage was not recorded, but it is generally between 1.5 and 4 milliamperes. The experiment is now repeated before you on our distinguished colleague's

forearm. Both the cathode and the anode should be applied along the sensory nerve. We are using now 25 to 30 volts. Contraction of the muscles is avoided by keeping the electrodes off the muscles. A special electrode should be made for this purpose. We prick our colleague's forearm with a pin, stick the pin into the skin until blood is drawn. Our colleague does not feel the sharp pain, but his sensibility to pain is not absolutely abolished. His forearm in the circuit feels as if it were "asleep"; the sensation of pain is deadened, distant and he does not make any defensive movement when you stick the pin through the skin, as you see.

Importance of Appropriate Electric Sources for Causing Electric Anesthesia.—We have indicated in our previous publications the importance of using appropriate electric sources for electric anesthesia. In the papers published by Professors Leduc and Rouxeau it is simply stated that a continuous city current was necessary, etc. And in our first papers on the subject of electric sleep which we had prepared in the laboratories of Professors Leduc and Rouxeau, we repeated with them that the city current was the proper one to use for electric anesthesia. But since 1905 our personal experience has taught us that it is dangerous to use the city current. While we were in Rome, Italy, in 1905, we were scheduled to present our experiments on electric sleep before the International Congress of Psychology. The city current in Rome is not a direct but an alternating current, so that it became necessary to use storage batteries. The electric anesthesia obtained with this current was far superior to that obtained in France with the city current. At first it was our impression that the Roman rabbit was more susceptible to this anesthesia than were the French rabbits; we wrote to the Professors above named that this was our impression. But on returning to their laboratories, in France, we resumed our work with the city current: the electric anesthesia was inferior to that obtained by us in Rome with a current from a storage battery. We then used a current from storage batteries and it was a great surprise to see a quieter and more marked anesthesia follow than was that obtained with the city current. It was now evident that the cause of superiority was due not to racial traits of the respective rabbits but to the difference between the two currents. The matter was now a simple one: the current obtained from a storage battery that is used for no other purpose is far more even than is a city current; the latter is always disturbed by running dynamos or lighting of lamps. The storage

battery current is like a smooth, quiet lake; while the city current is like a turbulent sea—for the purpose of electric anesthesia.

We have established the fact, therefore, that accumulators should be used for the supply of the continuous current.

And now, in this laboratory, that we have organized and have the honor of directing, we have installed a series of powerful storage batteries; we have here 126 volts from batteries of marked capacity, 200 amperes. We have installed this powerful current for various other experiments; but at the same time, we obtain as perfect electric anesthesia as can be obtained to-day.

We draw on 110 volts of these batteries; the rest of the current is used for the motor. Of the 110 volts of these batteries we use not more than from 5 to 10 volts, of minimal amperage,—from 1.5 to 2 milliamperes. According to the knowledge of professional electricians, it is wasteful to use such powerful batteries for such a minimal requirement. But according to our daily experiences in electric anesthesia the results obtained under these conditions are perfect. Physiology apparently does not lend itself to calculation by formula. According to this experience, it is well to use powerful batteries; in hospital work it is particularly important to obtain as perfect electric anesthesia as is possible to obtain, and large batteries should be used. Another advantage of having such batteries is that the current of 110 volts may be utilized for purposes of resuscitation of subjects in a condition of apparent death caused by various intoxications, or accidents.

We have installed here various electric currents for various experimental purposes; but it goes without saying that for electric anesthesia none but the current from storage batteries should be used; it is dangerous to use the direct city current; it is out of question to use a direct current transformed from an alternating current; this should never be done; currents from ordinary wet batteries should never be used, because the chemical decomposition goes on rapidly and the current is most uneven.

Technique and Instrumentation.—The instruments should be arranged as follows below:

The positive and negative poles of the current are connected with the respective terminals of a potential reducer, the lever of the reducer being at zero. The outlet terminal of the negative pole is connected with a wire, leading the current into the interrupter; from the interrupter the current is led into a milliamperemeter, into an ordinary switch and finally into a resistance box. The positive pole is led directly from the potential reducer

to the resistance box: The resistance box represents the patient or the animal. A voltmeter is connected with the potential reducer in derivation, of course.

Regulating the Period.—You begin the operation by regulating the period of the passage of the current. The circuit is closed by means of the switch. A chosen resistance is put in the circuit by means of the resistance box. The current is thrown into the circuit by means of the potential reducer—slowly, gradually. The voltmeter indicates the number of volts used, and the milliamperemeter indicates the number of milliamperes. Suppose there are 40 volts and 20 milliamperes, the current being uninterrupted, of course. (The wheel of the interrupter is placed so that the current can get through it.) Now, the motor of the interrupter is put into action and the current is being interrupted. Read the number of milliamperes now. Whatever that number is, your aim is to bring it to 1/10 period of the entire time of the passage of the current. If the entire period is represented by 20 milliamperes, then 1/10 will be represented by ten times less; in order to obtain this regulate the position of the movable contact lever of the wheel until the milliamperemeter registers 2 milliamperes. The period of the passage of the current is now 1/10.

This priod may be regulated by means of the special lever in the interrupter, and is indicated on the graduated scale provided for that purpose above the wheel. But a correct graduation involves a great deal of time on the part of the instrument maker, so that this part alone of the apparatus would cost ten times more than does the whole interrupter with its motor. Instrument makers will declare that their graduation is perfect, but do not bother with that. Just take a tiny bit more trouble and regulate the period as indicated here,—by means of the milliamperemeter: The period is of utmost importance in this work.

The Experiment.—Reduce the voltage to zero with the potential reducer; substitute the patient or animal for the resistance box and induce anesthesia by guiding the voltage slowly and gradually—by means of the potential reducer. Watch carefully the voltage and milliampereage, as indicated above.

Regulate the period every time before commencing an experiment. Do not rely on the fact that the period was regulated for an experiment an hour ago, or the day before. Without your knowing it, somebody or even yourself may have displaced the movable lever and so changed the period. This work is like all other work: the more attention you pay to its details, the better results it yields.

In case of any untoward symptom in the patient, break the

circuit by opening the switch. The patient resumes his normal condition with the breaking of the circuit. With this facility to break the circuit it is impossible to do the patient any harm with electric anesthesia; unless, indeed, the physician should allow a patient to remain in the circuit while there are signs of difficult breathing, cyanosis or of any other accident.

Should syncope take place, however, regardless of all precaution mentioned here, you have everything at your disposal to revive your patient: take off the cathode from the forehead, connect the wire of the cathode with the electrode—25 x 30 cts.—placed in the thoracic region; now, practice rhythmic excitations by closing and breaking the circuit—with the switch: closure—during ¼ or ⅓ of a second; opening—from 1 to 1.5 or 2 seconds. If the patient is cyanosed, you will see the cyanosis disappear and replaced by a natural color, normal respiration and heart beats. But accidents should never happen: we have never had any untoward accidents in animals.

Clinical Application (presentation of patients).—We present two patients on whom we have used electric currents of low tension and frequent interruption.

The first patient is a chronic alcoholist, who has been treated here, at the Ste.-Anne Asylum, several times during the last twenty years. For the last ten years he has been suffering from left hemianesthesia with marked blunting of the sense of taste and smell, abolition of the sense of touch, heat and pain.

The patient was subjected to electric currents of from 6,000 to 12,000 interruptions per minute, period of passage of the current 1/10, from 20 to 30 volts; cathode, 25 x 30 centimeters, at the dorsal region; anode, 12 x 25 cts., at the lumbar region. Duration of application, 30 minutes, every day during four weeks.

Result: disappearance of all the disturbances, as well as that of articular pains of ten years' duration (anode, 10 x 15 cts. was applied to the joints).

The second patient was treated similarly for right hemianesthesia of one year's duration; the patient had previously been treated by a leading specialist with the ordinary electric currents and massage, but no improvement resulted. Our treatment was kept up for four weeks. The patient made a complete recovery.

We do not undertake to explain the process by which the cure has been established; suggestion certainly played no part in the case of the chronic alcoholist; he objected to the treatment most energetically—before each sitting. The salient effect of this electric current is that of changing the blood pressure, as is shown in

all our contributions to this study (see our thesis mentioned above). Does the heightened blood pressure account for a nutritive change? This is a question for consideration.

On this patient we practiced rhythmic excitations such as one should use for purposes of resuscitation; from 20 to 90 volts were used for the excitations. The patient enjoyed the shocks and laughed as these were practiced. Hence, in cases of apparent death it is not dangerous to use such voltages.

Note: Electric anesthesia should not be combined with any other form of anesthesia. In our laboratory operations performed under electric anesthesia, preparatory to administering chloroform to the same animal, we found that the animal was profoundly agitated by the chloroform given while the electric anesthesia was kept up. The reason of this excessive agitation is a matter for physiologic study.

Since the publication of this paper, in November, 1908, we have tried, at Dr. Gwathmey's suggestion, a combination of morphinization and electric anesthesia. Dr. James Tayloe Gwathmey, of New York, who has contributed so much valuable work to the physiology of anesthesia, thought it would be practical to minimize the use of morphine by combining this with electric anesthesia. We were astonished to find that it was impossible to combine morphinism with electric anesthesia: a dog fully morphinized was excited and agitated when an electric current used for anesthesia was passed through its body with the head in the circuit, and a potential of only 1.5 volts. The maximum potential that the animal could stand without discomfort was one volt. The same animal was submitted to electric anesthesia when in its normal condition—on the previous day: the dose used was 9 to 10 volts, registering from 1.5 to 2 milliampères.

RESUSCITATION OF A WOMAN IN PROFOUND SYNCOPE CAUSED BY CHRONIC MORPHINE POISONING; MEANS USED: RHYTHMIC EXCITATIONS WITH AN INDUCTION CURRENT.—THE AUTHOR'S METHOD AND MODEL OF COIL.

(From Dr. Magnan's Laboratory, Ste.-Anne, Paris; Directed by Dr. Louise G. Robinovitch, of New York.)

By Louise G. Robinovitch, B. ès L., M.D.
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December, 1908, a young woman, a chronic morphine eater, was admitted to the Ste.-Anne Asylum, Paris, Dr. Magnan's service. She had indulged daily in two grams of morphine during a period of two years. When admitted to the hospital, she was suddenly deprived of her daily dose of morphine. While waiting to be examined by Dr. Magnan, she had a sudden attack of syncope. Various means were used to revive her, and she regained consciousness. We were not present there and cannot give any details of the means used; when we came into the receiving ward, the patient was apparently in good condition, but as Dr. Magnan was talking to us, the patient fell—in a second attack of syncope: her respirations became slow, shallow, appearing at very rare intervals—perhaps four or five per minute; the pulse was almost imperceptible, and her face was blue—almost black-blue—from asphyxia.

The assistant physicians immediately began to practice on her artificial respiration by the Sylvestre method and rhythmic traction of the tongue. These means to revive her were continued for twenty minutes—without any result. It was not thought advisable to carry the patient up to our laboratory—on the second floor, as it was feared that she might expire while being carried upstairs. Twenty minutes elapsed before we had our special coil for resuscitation brought downstairs and in working order, the electrodes in their proper places for resuscitation; the cathode in the dorsal region, anode in the lumbar region. Dorsal electrode measuring 25 x 30 cts., lumbar electrode—12 x 25 cts.

The patient was, by this time, quite "black in the face" and none of those present expected any good results from the application of rhythmic electric excitations. We practiced rhythmic excitations during a period of about thirty seconds; the duration of the closure of the circuit was about ¼ of a second; and the period of the opening of the circuit was about one second. We shortened the period of the opening of the circuit—as against our own indications in our papers on the subject of resuscitation, because the patient seemed to be thoroughly asphyxiated—as we judged her condition from the color of her face. As the rhythmic excitations were being repeated, it was astonishing to see the accompanying change of color in the patient's face; the dark blue color changed to pale, then to almost natural color; at the end of the thirty seconds of rhythmic excitations, the patient took a long spontaneous breath, opened her eyes and said: "Oh, I feel so cold in my back." The cold she felt was the wet cotton of the electrodes, of course. But the interesting point is that the patient felt no other inconveniences during the rhythmic excitations—while she was in profound syncope.

The absence of untoward sensations was to be expected: we report in another paper, published in this issue, the sensations experienced by a well person—when subjected to rhythmic excitations caused by a current of low tension and frequent interruptions, with a potential of from 20 to 90 volts: far from experiencing untoward sensations, the patient laughed as each shock was produced, causing artificial respiratory movements.

The potential used for the patient in syncope cannot be indicated in exact figures; the current was regulated by shifting the coil so as to obtain sufficiently ample respiratory and cardiac reactions.

The members of the medical staff who witnessed the operation declared the method to be far superior to the Sylvestre and Laborde method: as we have pointed out elsewhere, with our method we cause artificial heart beats as well as artificial respirations to take place. An assistant clasps the patient's tongue with a pair of forceps—so as to prevent the lifeless organ from occluding the larynx, and the operator simply closes and opens the circuit,—as is indicated in our papers on this subject.

There is no comparison between the results obtained with the Sylvestre and Laborde methods and those obtained with our method; the difference, in favor of our method, was particularly demonstrated in this case of morphine poisoning,—where respiratory paralysis is the first feature of the syncope and heart failure follows as a consequence. The alarming asphyxia, as shown in

the patient's face, did not yield to the usual methods of artificial respiration; in view of the gravity of the respiratory paresis this failure to revive the patient by means of the combined Sylvestre and Laborde methods was natural: the ordinary artificial respirations at their best do not compare in amplitude with those obtained by means of electric rhythmic excitations: with the latter the chest can be expanded to its maximum capacity: in the case of respiratory asphyxia this facility to supply fresh air is of the utmost importance. Besides, respiratory movements alone do not suffice to revive an asphyxiated subject: heart beats throwing oxygenated blood into circulation are quite as essential; with the ordinary means of artificial respiration we do not obtain the required conditions; but with the electric rhythmic excitations we obtain both artificial respirations and heart beats of required amplitude.

The facility with which the patient was revived by means of electric rhythmic excitations did not astonish us; in laboratory experiments we never failed to revive animals within a few seconds, if the rhythmic excitations were begun before life was completely extinct—while there were still signs of spontaneous respiration or heartbeat. While with the ordinary methods, as was shown in the case of this patient, artificial respiration and rhythmic traction of the tongue accomplished nothing within a period of twenty minutes. It is not possible to know whether the patient would have been revived with the old method after that period. The condition of the patient was alarming when she was handed over to us for the application of electric rhythmic excitations.

From the standpoint of utility in surgical cases, in which a patient suddenly lapses into syncope during the administration of chloroform, this case is most instructive: with the electrodes adjusted under the patient,—before the chloroforming and the operation is begun,—the surgeon need not fear a sudden attack of syncope in his patient: a few rhythmic excitations with the electric current invariably brings the subject back to life; we have demonstrated this in hundreds of cases of dogs, whose hearts are highly sensitive to chloroform poisoning or electrocution. The readiness with which resuscitation may be practiced by means of rhythmic electric excitations contrasts strongly with the difficulty encountered when using the Sylvestre-Laborde methods,—as was illustrated in the case just related. The facts certainly speak in favor of our method.

DIFFERENT EFFECTS OF VARIOUS ELECTRIC CURRENTS. CHOICE OF THE ELECTRIC CURRENT FOR PURPOSES OF RESUSCITATION OF SUBJECTS IN A CONDITION OF APPARENT DEATH CAUSED BY CHLOROFORM, MORPHINE, ELECTROCUTION, ETC.*

By Louise G. Robinovitch, B. ès L., M.D., *Paris, Member, New York Academy of Medicine; Member, American Medical Association; Foreign Associate Member, Medico-Psychological Society, Paris.*

Different electric currents have various effects on cellular life. In a series of experiments on dogs and rabbits, we found that in the matter of electrocution, the alternating was the most dangerous current to cellular life; next in destructive effect to vitality was the continuous current; next to this was the induction current; and the least destructive of lethal currents was the current of low tension and frequent interruption.

Thus, a dog electrocuted with an alternating current, so that there was suspension of blood pressure in the carotid artery and of respiration for some two minutes, could not be resuscitated by practicing on it rhythmic excitations with the same current.

A dog electrocuted with a continuous current, so that blood pressure in the carotid artery and the respiration were suspended for two minutes, could not be resuscitated by practicing on the subject rhythmic excitation with the same current.

But a dog electrocuted with a continuous current could be resuscitated by practicing on it rhythmic excitations with a current of low tension and frequent interruptions.

A dog electrocuted with an induction current could not be resuscitated with rhythmic excitation with the same current, but could be resuscitated by causing rhythmic excitations with a current of low tension and frequent interruption.

A dog electrocuted with a current of low tension and frequent

* An abstract of our findings on the various effects of different electric currents was presented at the Congress of Neurologists, held in Geneva, Switzerland, August 1-7, 1907, and at the International Congress of Neurology and Psychiatry, held at Amsterdam, Holland, September 2-7, 1907.

interruption is resuscitated with the same current with greater facility than is an animal electrocuted with any of the other dangerous currents mentioned.

We use the term "alternating," "continuous," "induction," current, etc., in the large meaning of the word; for in reality each variety of current has its sub-varieties,—according to the way in which it is obtained. Thus, the induction current is a deadly current to animal life; but the deadly effects of this kind of current vary with the resistance in the coil used. If the coil is of medium sized wire, say 6/10 mm., an electrocution with a current from this coil is far less fatal than is an electrocution with a current from a coil of finer wire.

For purposes of resuscitation, the choice of an induction current should be governed by this fact; a coil of finer wire than 6/10 mm. should never be used.

The marked vital disturbances produced by a lethal current taken from a coil of fine wire (No. 3 coil, of the Dubois-Reymond apparatus) are illustrated in our thesis, entitled "Sommeil éléctrique, épilepsie éléctrique et éléctrocution, Paris, 1906, pp. 82, 83; trace No. 27 in this thesis shows that the blood pressure in the carotid artery during an electrocution with an induction current is not nearly as high as it is in electrocutions with other currents. We shall not analyze here the reason of this difference; but the fact is stated simply to point out the different physiologic effect of different currents. Some day in the future, neurologists will wake up to the fact that it is important to know the value of electric currents applied daily in clinical work: it is easy to prescribe for patients "strong" or "weak" currents—as these are obtained with induction coils of fine or coarse wire of a Dubois-Reymond apparatus; but it is also important to know the respective physiologic effects of these currents.

In our estimation, in the future, the choice electric current for use in neurologic clinics will be the current of low tension and frequent interruption. This current can be measured to minimal practical doses,—from one volt or even a fraction of one volt up, and the operator can direct at will the blood pressure in the limb under treatment, without subjecting the patient to any untoward after effects.

The blood pressure and respiration under the influence of this current is fully illustrated in the traces in our thesis above cited.

The effect of various electric currents in resuscitating electrocuted animals applies equally to the resuscitation of subjects in a condition of apparent death from various causes: chloroform, morphine, etc. For purposes of resuscitation, the current of low tension and frequent interruption is the best.

PRESENTATION OF INSTRUMENTS: MOTOR-INTERRUPTER SUPPLYING A CURRENT OF FREQUENT INTERRUPTIONS FOR ELECTRIC ANESTHESIA.*

By Dr. Louise G. Robinovitch, New York.

The motor-interrupter for electric anesthesia made for Profs. Leduc and Rouxeau, is described in our thesis, Paris, 1906: "Sommeil Eléctrique, Epilépsie Eléctrique et Eléctrocution." This interrupter presented the inconvenience of causing muscular tremor and rigidity of the animal. The second model made by the same house in Paris was discarded by us as a dangerous instrument for this work. Since that time we have modified every detail of the interrupter.

With our own model of the motor-interrupter, made by Gaiffe, we obtain electric anesthesia without muscular tremors or rigidity; the animals limbs remain in a normal condition during the entire duration of the anesthesia.

The Wheel-Interrupter.—The wheel of the first models was made of compressed fiber enclosed in a metallic armature, the sectors of which were united by means of metallic plates running through the thickness of the compressed fiber. There was a disadvantage in this construction because compressed fiber changes in shape under the influence of electric currents; and in the course of time the wheel became elliptical; this shape was not perceptible to the naked eye, but the contact with the levers was changed, and the animal suffered from the irregularity of the current on this account; muscular tremors and rigidity were due in great part to this cause.

In our model all the elements of the wheel are changed: the wheel is made on the principle of a commutator; it is made of metal and the insulator is mica. This construction does away with the inconveniences found with the wheel made of compressed fiber. The interior of the wheel is covered with mica and the metallic armature is insulated from the mass of the wheel

* We are considering the utilization of a newer variety of electric current—obtained without mechanical contacts; this current is highly regular and reliable. November, 1909.

by a layer of mica 15/10 mm. thick. The insulators between the sectors of the metallic armature are made of ebony or compressed fiber. In the interior of the wheel the sectors are connected by means of wire of large diameter.

The levers of the wheel are made as flexible and adjustable as possible so that contact with the wheel is easy and soft without bearing too much pressure on it. The joints of the levers are made on the principle of steel springs in the newest registering tambours of Marey, made by M. Boulitte, of Paris. The end of the lever that is in contact with the wheel is made of layers of copper netting. Perfect contact with little pressure is obtained with these flexible levers. The pressure of the springs and the contact of the levers are regulated by means of pressure screws.

The movable lever is mounted on an endless screw. This lever is surmounted by an index needle or hand that reaches to a graduated scale above the wheel. The endless or microscopic screw is below the wheel. The position of the movable lever is changed by means of the endless screw; the needle gliding along the graduated scale indicates the period of the passage of the current. The contrivance for regulating the period is perfected in our model as much as possible; but in our own work we never rely on indication thus obtained: the process of graduating the scale requires much time of a skilled mechanic; and the price of an accurate scale is expensive. We regulate the period by means of the milliamperemeter, as is indicated in our paper on electric anesthesia, published in this issue.

The period of the passage of the current is regulated by changing the position of the movable lever in relation to the immovable lever; the change of position is made by means of the endless screw.

For testing the speed of the motor we use Dechiens' tachymeter. In our model the tachymeter is adjusted to the axis of the motor on the principle of a piston within a syringe; so that the tachymeter may be put into action to indicate the number of turns and then withdrawn. We have had this arrangement made so as to avoid unnecessary bearing of weight or friction on the axis of the motor. In our own work we prefer a tuning fork to a tachymeter.

The so-called tachymeter furnished by Gaiffe with his second model of interrupter was discarded by us—together with the motor and interrupter, three years ago. That tachymeter is used for automobiles, but should not be used for work of precision.

Of the small motors running on from 16 to 110 volts, that

known as type Contremoulin-Gaiffe is the most regular motor. Motors of the type generally used for ventilators have given us most disastrous results on account of the irregularity in their course. These motors heat up quickly; the resistance is changed and consequently the speed is changed. The animal in the circuit is the sufferer thereof.

For more serious work we have had a special motor made for us by Sautter and Harlé, Paris; this is a powerful motor, running slowly but regularly.

The physician should not take any medical electrician's advice on the regularity of a motor: what appears to be regular to the mechanic does not always prove to be regular to the physiologist. We have tested almost every type of motor in the market and have not found any that approach to the pretense of regularity except the motors mentioned as such, and even these two are not the most satisfactory ones.

The essential qualities of a motor-interrupter for purposes of electric anesthesia consist of regularity in the course of the motor; flexibility of the contact levers at both commutators and in the regularity of form of the wheel.

Within the limits of possibility these conditions are fulfilled in our model.

Electric Source for the Motor.—The electric source for running the motor should be separate from the electric source used for causing anesthesia, and both sources should be furnished by storage batteries of large capacity.

Electricians will tell you that the alternating current will run the motor more regularly than any other current. Don't pay any attention to the electrician: if you followed his advice you would kill your patient in the circuit, with a motor running on an alternating current.*

Do not use ordinary wet batteries for your electric source: the chemical decomposition goes on too rapidly, and the stability of the current is impaired.

Do not use the direct city current for running the motor: we have tried it and discarded its use in our work.

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* For the last few years, we have been insisting on the danger of using any other electric currents than those indicated by us.

Presented at the Société clinique de médecine mentale, and published in the *Bulletin de la Société clinique de médecine mentale,* November, 1908.

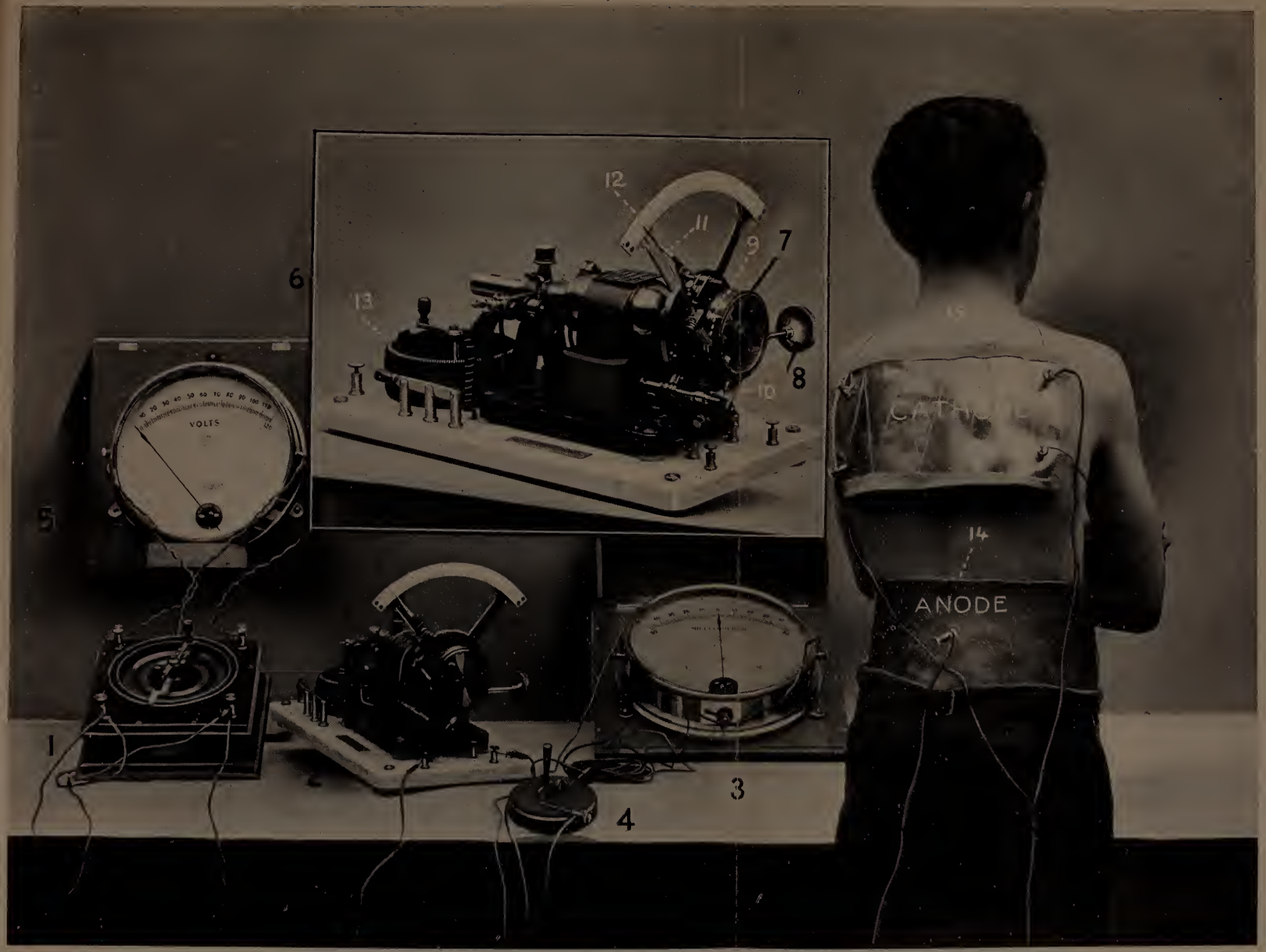

Fig. 1.—Dr. Robinovitch's model of interrupter: 1, potential reducer; 2, motor-interrupter; 3, milliampèremeter; 4, switch; 5, voltmeter; 6, enlarged view of motor-interrupter; 7, interior of wheel; 8, endless screw; 9, movable lever; 10, fixed lever; 11, hand moving with movable lever; 12, graduated scale; 13, rheostat for motor.

INDUCTION COIL SPECIALLY CONSTRUCTED ACCORDING TO OUR INDICATIONS FOR PURPOSES OF RESUSCITATION OF SUBJECTS IN A CONDITION OF APPARENT DEATH CAUSED BY CHLOROFORM, MORPHINE, ELECTROCUTION, ETC.*

For purposes of resuscitation we consider the current of low tension and frequent interruption superior to all other currents. But for practical purposes in cases of accident where this current cannot be had, we use an induction current supplied by a coil of large size especially constructed for the purpose of resuscitating human beings. It is an ordinary induction coil, the wire of which is 6/10 mm. in diameter. We do not know the exact number of layers used, but the whole coil weighs about seven kilograms; the weight of the wood enclosing the core is estimated at about 50 grams. The core measures about one inch in diameter. The diameter of the wire of the primary coil is 12/10 mm.; six layers of wire is used. The voltage of this coil is high. The amperage should be calculated. The proper potential for the rhythmic excitations is obtained by shifting the position of the secondary coil. The diameter of the wire of the coil is of utmost importance for purposes of resuscitation. Do not allow your electrician to use any wire of smaller diameter than 6/10 mm. In our experiments on animals we failed to resuscitate subjects when using the coil of fine wire of the Dubois-Reymond apparatus; we succeeded only with the coil of middle size, No. 2, the wire of which meas-

* Since the presentation of this paper at the Société clinique de médecine mentale, Paris, November, 1908, we have constructed a new coil that is far superior to the one just described (see description of new coil in this issue).

ures about 6/10 mm. in diameter. We reported this fact to various medical congresses. (See our paper entitled: "Method of Resuscitating Electrocuted Animals," etc., JOURNAL OF MENTAL PATHOLOGY, Vol. VIII., No. 3, 1907.) Do not allow your electrician to mix the layers of wire, using fine and coarse wire: all the layers should be of the same diameter.

In our induction coil an appropriate condenser for the primary coil is placed at the bottom of the apparatus. The apparatus is run on 8 volts of accumulators, capacity—40 amperes.

The rhythmic excitations are caused by opening and closing the secondary current with a switch. Do not commit the error of opening and closing the circuit by means of the switch at the direct current or the inducing current: such an error during resuscitation of a patient may cost you your patient's life—through loss of time in re-establishing the induction current after each opening. If in doubt as to the proper switch, interrupt your secondary current by touching the terminal of the coil with the wire that is usually screwed into this terminal—at the negative pole.

Under such conditions, instead of screwing the end of the conducting wire into the terminal of the coil, hold the end in your hand; close the circuit by touching the terminal of the coil with the end of the wire in your hand; open the circuit by taking away the end of the conducting wire from the coil terminal.

In a case of emergency, and in the absence of a switch, we have recently resuscitated a patient by this means.

Your electrician will assure you that a finer wire in a coil gives a "stronger" current. By this he means that the current is more painful to normal subjects; as indeed, it would be impossible for you to stand the pain caused by currents of the fine wire coil, or coil No. 3, of the Dubois-Reymond apparatus—when the coil is advanced near zero of the scale; but you easily stand the discomfort caused by the coil of coarser wire, coil No. 2, even when the coil gives its maximum potential. But do not listen to the electrician: insist on having the diameter of the wire for the coil not less than 6/10 mm. or you will lose your patient by using a coil of finer wire.

The facts we state are based on laboratory work. We have failed to resuscitate electrocuted animals when using No. 3, or fine wire coil, of the Dubois-Reymond apparatus. The failure was due to insufficient or even absent cardiac and respiratory reaction. We pointed out the fact that the fine wire coil, while deadly to cellular life, causes only a slight increase of blood pressure as compared with the action of the coarser wire coil.

This important fact accounts for the failure to revive electrocuted animals with currents supplied by fine wire coils. (See p. 82 of our thesis, entitled "Sommeil Eléctrique, Epilépsie, Eléctrique et Eléctrocution," Paris, 1906. Also see trace No. 26, on p. 83, showing the slight elevation of blood pressure with a fine wire coil.)

No. 1, or coarse wire coil of the Dubois-Reymond apparatus is useless for purposes of resuscitation,—the amperage of the current is almost nil. But No. 2, or medium coil, gave us good results.

Needless to remark that the coil of our own model is many times more effective than is the coil of the Dubois-Reymond apparatus. For purposes of resuscitating human beings the Dubois-Reymond apparatus is useless; our model of coil should be used, and our latest model, described in this issue, should be chosen.

Jolyet's Cannula, Modified by Dr. Louise G. Robinovitch. —The modification of the cannula has been made for the purpose of avoiding accidental separation of the cannula from its faucet; such an accident happened to us while registering the blood pressure in the carotid artery of an animal, a serious hemorrhage resulting from the mishap. The modification or perfection is as follows below:

The crown of the hollow piston of the faucet is furnished with a latch; while a corresponding notch is made in the crown of the cannula. When the latter is inserted in the large blood vessels, the hollow piston is inserted into the cannula so that the latch passes through the notch; then the piston is turned a few millimeters inside the cannula; this movement locks the cannula in a way similar to that in which a window latch locks a window. (See Fig. No. 1.)

A Two Cylinder Registering Apparatus. Professor Rouxeau's Model (Nantes).—Professor Rouxeau, of Nantes, France, has made a convenient modification of Marey's registering apparatus: the three columns of support for each drum are eliminated—together with the plates that the columns supported above and below each cylinder. The convenience of not having these plates is that the paper used for registration may ascend or descend above or below the cylinders—without stopping the course of the apparatus—by reason of the obstacle in the shape of those plates. Each cylinder is supported by one strong metal brace. (See Fig. No. 2.)

Professor Rouxeau has also eliminated the vessel for holding a solution of water and glycerine or any other substance, destined to regulate the speed of the apparatus: an appropriate motor answers the purpose and does away with the inconvenience of escaping drops of liquid—on the blackened paper.

The support for the various registering instruments,—tambour, chronograph, etc., is also conveniently modified. (See Fig. 3.)

The simple stem of support of Marey's apparatus does not always suffice for placing properly all the registering instruments; Professor Rouxeau has made an excellent modification in the stem.

The vertical stem is enveloped in a metal sheath or hollow tube; by means of a pressure screw this metal tube may be fixed at any height along the vertical stem. Two transverse bars are mounted on this sheath; one end of the lower one is fixed on the sheath, encircling it with a ring; a pressure screw going through the ring and the sheath, makes it possible to displace and fix the sheath at any height on the stem. The bar itself is for the purpose of changing the position of the sheath.

The upper bar is somewhat more complicated: it is 13 centimeters long, 15 mm. high, and 3 mm. thick; two vertical stems are mounted on this bar; each vertical stem can be placed at any desired position on the horizontal bar; the stems are fixed in their respective positions by means of pressure screws.

With this arrangement of vertical stems it is possible to mount several registering instruments without inconvenience.

A Hand Signal.—By Dr. Louise G. Robinovitch, of New York.*

The hand signal is used in physiologic experiments and may be substituted for the electric signal. This signal has been made on the principle of Professor Rouxeau's signal. Our model consists of an ordinary coarse tambour of Marey; the metal tube of the tambour is connected with a rubber tube and bulb,—such as are used in photographic apparatus; a metal horseshoe with a pressure screw surmounts the lever. The rise of the lever is restricted and can be regulated with the pressure screw. When pressing on the rubber bulb, the lever rises; when releasing the bulb, the lever falls; the signal is traced on the paper during the rise and fall of the lever. We use this signal instead of Deprez' signal.

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* Presented at the July meeting, 1908, Société Clinique de Médecine Mentale, Paris.

We thank M. Boulitte, of Paris, for having helped us simplify this instrument.

A Portable Chronograph Giving Scale Traces.—By Dr. Louise G. Robinovitch, of New York.*

The chronograph giving second traces, thus: ⌐¬⌐¬ each horizontal line = a second, consist of a pendulum clock, the pendulum causing interruptions in an electric circuit. Such chronographs are in use by Professor Rouxeau, of Nantes; Dr. Bull, of the Institut Marey, in this laboratory, etc. We present to-day a portable chronograph made according to our indications and that may be substituted for the clock chronograph.

The principle on which our chronograph is made is similar to that of other chronographs: the period of seconds is obtained by means of a mechanism of an ordinary clock work; and the interruptions every second are obtained by means of breaks in an electric circuit every second: the clock work causes the motion of a notched wheel and a lever falls from one notch on the other successively—every second—while the wheel is in motion; the time of contact of lever with each notch and of fall on each notch is equal—one second. An electric current of ordinary bichromate cells is made to pass so that the circuit is closed at each contact of the lever with a notch on the wheel; the circuit is open—during the fall of the lever from one notch upon the one following; these successive closures and openings of the circuit are registered by lines—known as ladder scale traces; the lines are traced by a Dèprez signal in the same circuit with the wheel, as you may see in the arrangement of the instruments before you.

* Presented at the July meeting, 1908, at the Société Clinique de Médecine Mentale, Paris.

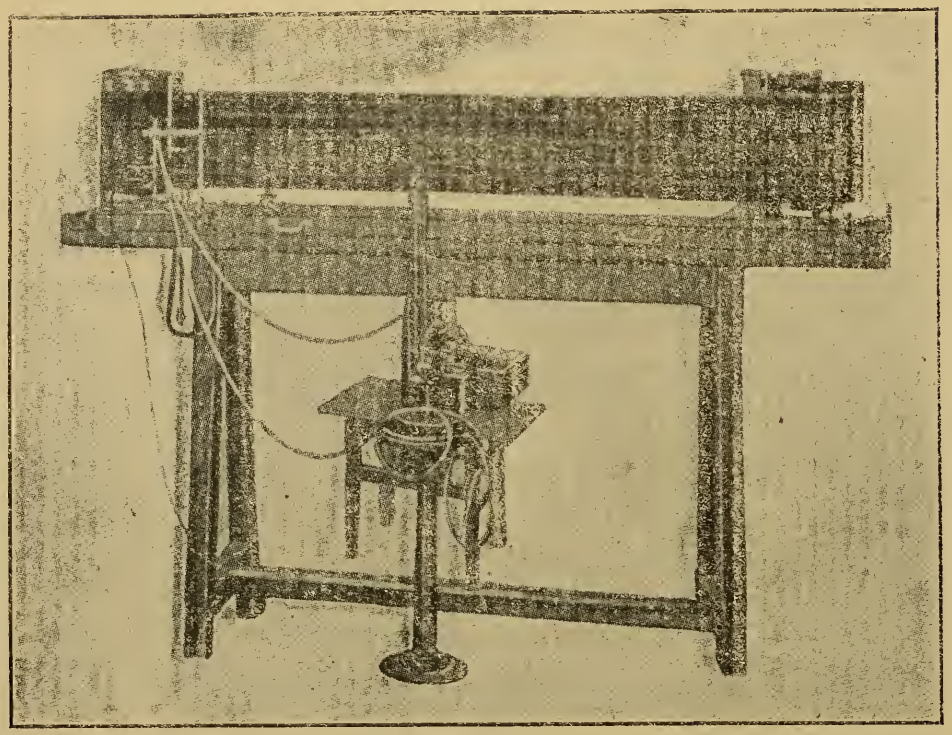

FIG. NO. 2.—DOUBLE CYLINDER REGISTERING DRUM.

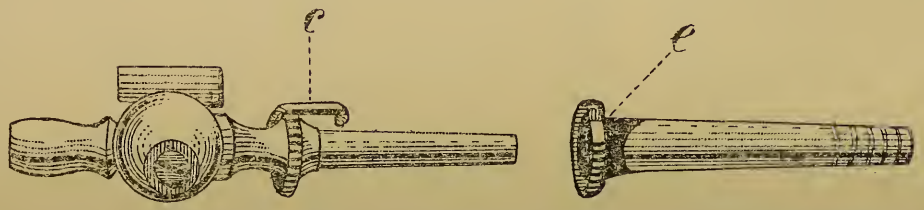

FIG. NO. 1.—JOLYET'S CANNULA MODIFIED BY DR. LOUISE G. ROBINOVITCH.
C—LATCH; E—NOTCH.

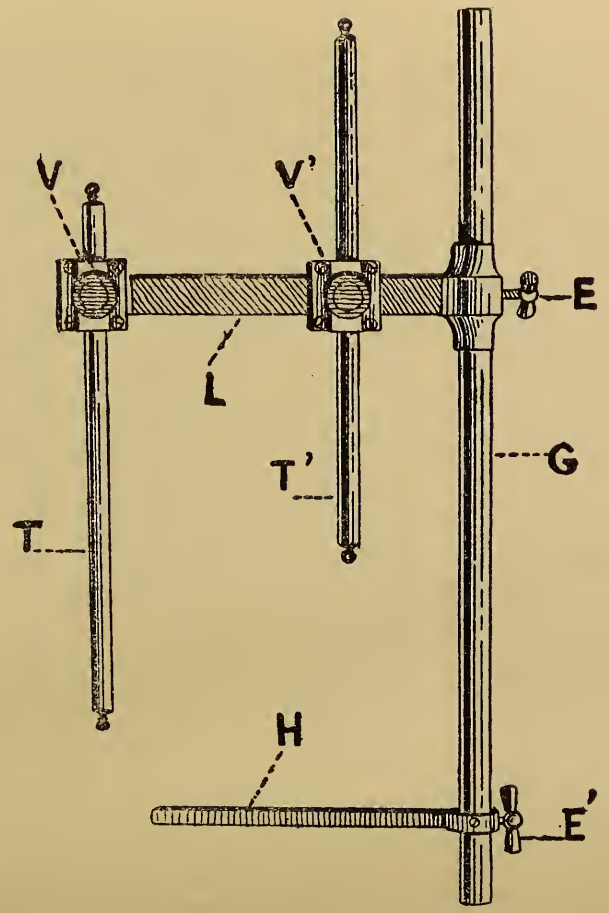

FIG. NO. 3.—G—METAL SHEATH; E AND E'—PRESSURE SCREWS;
L, H—TRANSVERSE BARS; T, T'—VERTICAL STEMS;
V, V'—PLACE OF FIXATION OF THE VERTICAL BARS.

EXPERIMENTAL LESION OF THE SPINAL CORD PRODUCED BY MEANS OF LETHAL ELECTRIC CURRENTS. DIFFERENT EFFECTS OF VARIOUS ELECTRIC CURRENTS.

(A preliminary communication.)

By Louise G. Robinovitch, M.D., New York.

In 1905, while working in Rome, Italy, we produced in a rabbit an experimental lesion of the lumbar region of the spinal cord by means of repeated shocks with lethal electric currents. The animal was submitted to an electric current supplied by wet bichromate batteries; the potential was seventy volts, showing about 20 to 30 milliamperes,—while the current was being interrupted some three hundred times per minute with an ordinary vibrating rod. The negative electrode—4 x 4 cts. was applied to the forehead and the positive electrode, 10 x 10 cts. was applied to the lumbar region. This current was about five times stronger than is necessary to electrocute a rabbit; the time of application of the current was about one minute and was repeated several times every day during three or four days. After the last application of the shock the animal showed weakness of its posterior limbs; this condition developed into frank paralysis of the hind legs on the following day; sensation to pain caused by pricking with a needle was retained but motion was completely impaired, the animal dragging its hind legs when changing position. There seemed to be fecal and urinary incontinance. Death followed within about a week.

Since 1905, we have produced experimentally similar paralytic conditions in rabbits by subjecting them to lethal shocks with induction currents, the shocks being prolonged until apparent death seemed to be imminent. These shocks were repeated several times daily for three or four days until paralysis of the hind legs set in.

This spinal lesion is not easily obtained in all rabbits subjected to the experiment; it was only in exceptional cases that the lesion was obtained; some of the animals were ordinary domestic rabbits while others were Belgian hares. But the possibility of causing such lesions with induction currents and slowly and irregularly interrupted currents (300 times per minute with a vibrating rod) is a fact worthy of notice.

Indeed, these experiments seem to point once more to the importance of choice of electric currents for application in man.

In 1906, we pointed out the danger accompanying the use of the positive pole at the forehead and of the application of induction currents when the cerebro-spinal axis was in the circuit (1). In 1907, 1908 and 1909, we presented our studies on the different effects of various electric currents for purposes of resuscitation of subjects in a condition of apparent death (2); and our present experiments lead us to caution neurologists once more against the indiscriminate application, in clinical neurology, of induction currents and of currents with undifferentiated poles.

In our opinion the safest current is the one of low tension and frequent interruption, that we use for producing electric analgesia and for resuscitation. We applied this current to a rabbit during a period of eight hours and twenty minutes without causing any after effects (3). We never caused any spinal lesions in dogs subjected to electrocution and resuscitation by means of this current. We generally subject dogs twice to electrocution and resuscitation; the first time the blood pressure is taken in the carotid artery, the operation being performed while the animal is under the influence of electric analgesia; the second operation is performed on the femoral artery—under similar conditions,—some four to six weeks after the first operation. We generally use 120 volts, showing some 140 milliamperes, for electrocuting dogs. The duration of electrocution is from a few seconds to 2 minutes; the duration of resuscitation is from a few seconds to from 3 to 3.5 minutes, according to the case. Some dogs we kept for over a year after the second operation, but they did not present any lesions at all.

The questions that present themselves in connection with these experiments are as follows:

1. Are rabbits especially susceptible to lesions of the lumbar region of the spinal cord when subjected to strong and repeated electric shocks with induction currents?

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1. Dr. Louise G. Robinovitch.—Sommeil éléctrique, épilépsie éléctrique et éléctrocution, thesis, Paris, 1906, pp. 34 to 43.

2. Dr. Louise G. Robinovitch.—Method of resuscitating electrocuted animals, etc. *Journal of Mental Pathology,* Vol. VIII, No. 3, 1907.

De l'emploi des courants éléctriques pour le rappel à la vie, dans les cas de mort apparente causée par le chloroforme ou par l'éléctrocution: nécessité d'exclure du circuit la tête pendant les excitations rythmiques, etc. *Bulletin de la société clinique de médecine mentale,* No. 4, November, 1908.

Méthode de rappel à la vie des animaux en syncope chloroformique et des animaux en mort apparente causé par l'éléctrocution. Effets différents de différents courants éléctriques. Importance d'exclure du circuit la tête de l'animal pendant les excitations éléctriques. *Comptes rendus des séances de la société de Biologie,* February 1, 1908, T. LXIV, p. 167.

Different effects of various electric currents. Choice of current for resuscitation,—in this issue.

3. Louise G. Robinovitch.—Thesis cited, pp. 32 and 33.

2. Is the Belgian hare especially susceptible to such lesions?

3. Is the positive pole more destructive to cellular life than is the negative pole? (See our thesis: *Sommeil éléctrique, épilepsie éléctrique et éléctrocution,* Paris, 1906, pp. 34 to 43.)

4. Is the lumbar region of the rabbit or the Belgian hare less resistant than is any other region of these animals' spinal cords?

Lesions of various parts of the body have been reported as results of electric shocks, but the pole at which the lesion was caused is, of course, not known. Professor Battelli reports opacity of the cornea of animals (dogs, guinea pigs) as a result of shocks with alternating currents (4).

The current of low tension and frequent interruption that we use for electrocution and resuscitation as well as for producing analgesia has never left any effects. In man we apply this current to the eyes during a period of one hour, during a week, without causing any after effects. In one case we applied this current to the eyes of a patient for relieving high tension in the eye-balls accompanied by headache. The relief was complete. Three-quarters of a milliampere were used. We apply a similar current for causing sleep in man: no after effects have resulted. The duration of application was one hour daily during a week.

We are conducting a series of experiments on the various effects of different electric currents when applied to the eyes. The results will be reported in another paper.

The microscopic studies of the lesions of the spinal cord will be reported later.

4. Battelli.—La mort par les courants éléctriques; courant alternatif à bas voltage et à haute tension. *Journal de Physiologie générale,* No. 3, 1899.

TRIPLE INTERRUPTER OF DIRECT CURRENTS FOR RESUSCITATION. PORTABLE MODEL FOR AMBULANCE SERVICE.

By Louise G. Robinovitch, M.D., New York.

For purposes of resuscitation the preferred current is the one of low tension and frequent interruption. The current obtained with our model of interrupter described in this issue gives us good results but the apparatus is rather heavy for transportation in ambulance service. We have constructed a triple interrupter

of direct currents that gives good results in laboratory work and is portable and suitable for ambulance service.

The apparatus consists of three separate primary induction coils, with their cores; each coil is run on four dry battery cells; the three coils are placed side by side, but are not connected in any way. Each primary coil with its core is utilized for the purpose of causing the vibration of a steel ribbon; a contact button that is insulated from but fixed to the ribbon, is attracted and released at the core of the coil, and the steel ribbon vibrates as the makes and breaks take place. The rapidity of vibrations of the steel ribbon is regulated in a manner similar to that in which one regulates the rapidity of vibrations of a violin string; the tighter the ribbon the more rapid are the vibrations; the range of vibrations of the ribbon is between 15,000 and 25,000 per minute. The vibrations of this ribbon are utilized for the purpose of making and breaking the circuit of a simple direct current as follows: a delicately arranged spring lever contact touches the side of the vibrating ribbon every time the ribbon is released from the core; this contact lever is separated from the ribbon every time the ribbon is attracted toward the core. We thus have a system of makes and breaks between the ribbon and the spring lever.

The lever is in the circuit of a direct current of any voltage chosen, say the street current. This current is controlled with a suitable potential reducer so that one may utilize from a fraction of a volt to 120 volts. Makes and breaks of the circuit of the direct current take place as the steel ribbon vibrates and touches or separates from the contact lever. The rapidity of the makes and breaks depends on the rapidity of the vibrations of the steel ribbon. Suppose the ribbon vibrates 15,000 times per minute; the direct current is then interrupted 15,000 times per minute. The direct current thus interrupted is then led to a second vibrator, at the second coil, causing say 5,000 interruptions per minute; the direct current is now interrupted 20,000 times per minute; this interrupted current is now led to a third interrupter, at the third coil, causing, say, 5,000 interruptions per minute; the direct current is now being interrupted 25,000 times per minute. Each interrupter can be regulated to give more interruptions, so that the direct current may be interrupted some 40,000 to 50,000 times per minute. A voltmeter in shunt and a milliamperemeter in series measure the current used.

Relative physiologic value of direct and interrupted currents for purposes of resuscitation.—Physiologically the direct current causes less marked cardiac and respiratory reac-

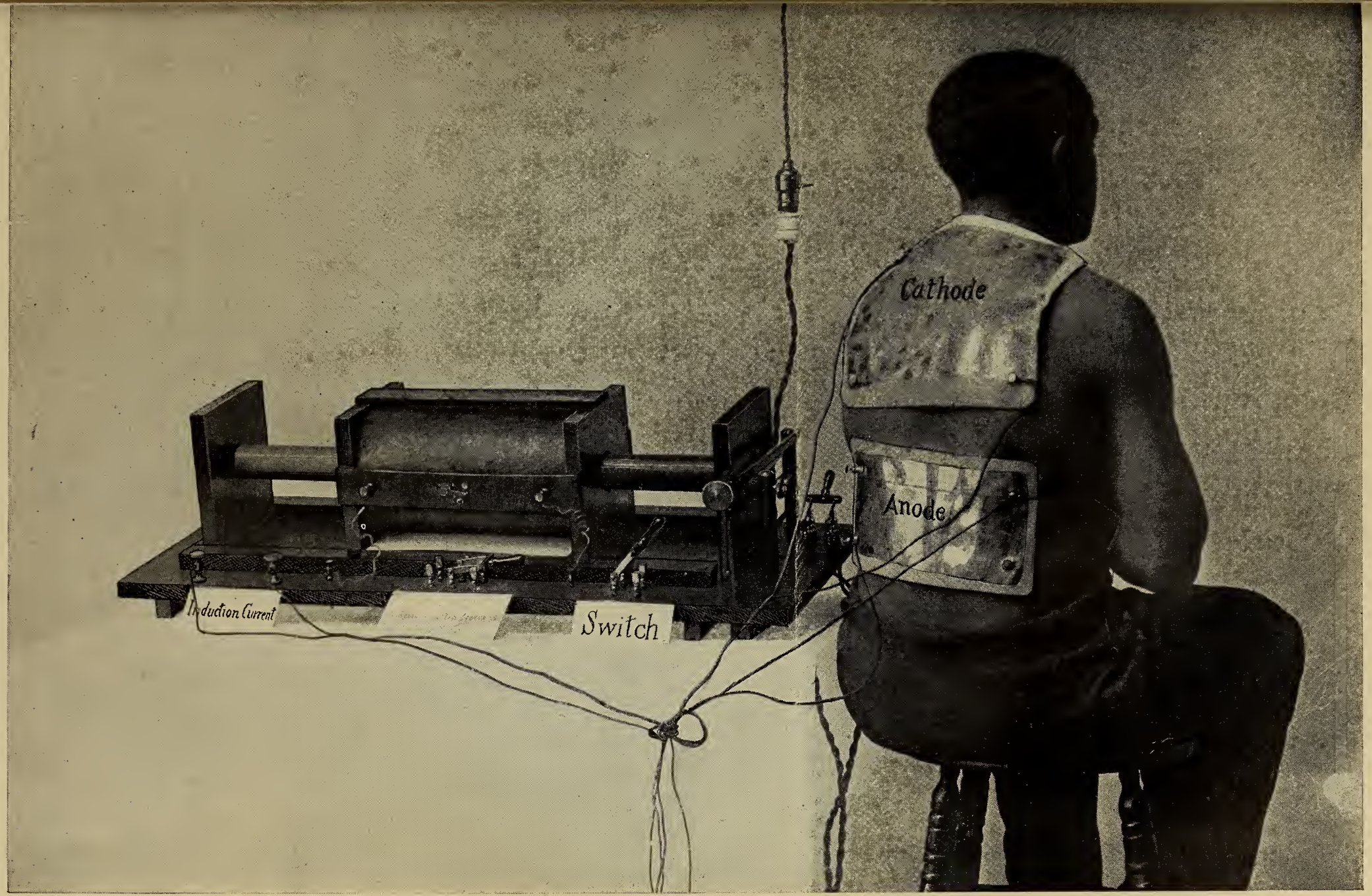

Figure 2.—Induction coil with ribbon vibrator.

tions, than does the same current when interrupted; and slow interruption causes less marked reactions than does rapid interruption, as is explained below.

One of us in the laboratory took into his hands the electrodes in the circuit of a simple direct current. The circuit was suddenly closed with a switch, the meters registering 20 volts and 2.5 milliampères; the energy of muscular contraction was noted arbitrarily as 1. This direct current was now interrupted 15,000 times per minute; the circuit was closed as before, and the meters showed 20 volts, but only 1.5 milliampères, and the energy of muscular contraction was 3 times stronger than was that obtained with the direct current. Finally, the current was interrupted with the second interrupter 20,000 per minute, the circuit closed as before; meters showed 20 volts, only 0.5 milliampères, but the energy of muscular contraction was estimated as being 6 times stronger than was that obtained with the same voltage of the direct current. These effects are summarized below:

Direct current, 20 volts, 2.5 milliampères, energy contract. 1.
15,000 inter., 20 volts, 1.5 milliampères, energy contract. 3.
20,000 inter., 20 volts, 0.5 milliampères, energy contract. 6.

These effects seem to be astonishing, but they are facts: the direct interrupted current gives better results for resuscitation than does the simple direct current. Besides, the direct interrupted current, with its low amperage does not exhaust the cardiac and respiratory reaction as rapidly as does the simple direct current.

INDUCTION COIL FOR PURPOSES OF RESUSCITATION.—This coil is made on lines similar to those given in the description of our first model described in this issue: the wire of the primary coil is 12/10 mm. in diameter, and that of the secondary coil is 0.6 mm. in diameter; there is a condenser in the primary circuit. In the present model the secondary coil is made in sections controlled by a button switch, so that part or all of the current may be utilized. The vibrator is a steel ribbon that can be made to vibrate some 25,000 times per minute. This coil gives better results than did our first model of coil. But our preferred current for resuscitation is the one of low tension and frequent interruption as it is obtained with our model of the wheel interrupter; the triple interrupter also gives good results for resuscitation. The induction current obtained with our model of coil is our third choice, although we have had good results from its use in animals as well as in man.

PHYSIOLOGIC EFFECTS OF A NEW VARIETY OF ELECTRIC CURRENT.*

By Louise G. Robinovitch, New York.

Within the last few days we came across an apparatus producing electric currents of great regularity. The current is a sinusoidal one of very pure and smooth wave form and its frequency may be controlled at will. The regularity of the wave results from the fact of its being obtained by a purely electrical method (by means of the action of a magnetic field on the current in a mercury vapor tube) without moving mechanical parts or contacts. The apparatus is capable of producing either a pure alternating current that reverses at regular periodic intervals or a pulsating current that has the same sinusoidal wave form but flows always in one direction without reversing.

We tested the value of the pure alternating current for producing general anesthesia. The subject was a rabbit. One electrode 4 x 4 ctms., was aplied to the forehead, the other, 10 x 10 ctms., to the loins. The current was a simple alternating one, but its wave form was of great regularity.

In the beginning of the experiment the animal's temperature was 99 degrees F., respiration 50 per minute. The frequency of the current was 1,100 cycles per second, the intensity was 6 milliamperes. After 20 minutes the animal's temperature rose from 99 degrees F. to 101.8 degrees F., and the respirations became so rapid that they could not be counted. The reflexes were highly exaggerated. The objectionable effects of this alternating current were similar to those obtained by us from the application of ordinary induction currents, in which case the animal succumbed with high fever and rapid respirations (1). This experiment confirmed once more our claim that it is dangerous to utilize alternating and induction currents in living beings.

At our suggestion, Mr. Frederick K. Vreeland kindly consented to modify the character of the current obtained with his oscillator (2) so that the simple alternating type that reverses was replaced by a pulsating type, that has the same sine wave

* Presented at the New York Academy of Medicine, November 4, 1909, and before the New England Association for Physical Therapeutics, November 12, 1909.

1. Dr. Louise G. Robinovitch.—Sommeil éléctrique, épilépsie éléctrique et éléctrocution, thesis, Paris, 1906, p. 43.

form but does not reverse. This pulsating current is made up of two component parts: one—alternating and the other—direct that can be combined in any desired proportion. The best results—when applied to an animal—were obtained when the alternating component was about 0.7 of the direct component; so that the resultant pulsating current just came to zero in each cycle without reversing.

We submitted a rabbit to this pulsating current, with the cathode at the head and the anode over the loins. The animal fell into a perfectly quiet state of relaxation under the following conditions:

Pulsating current—frequency 125 cycles; direct current component 5.7 milliamperes, alternating component 4.2 milliamperes.

At the beginning of the experiment the animal's temperature was 100 degrees F., respiration 80 per minute. The animal was excited: it had been in a basket for two hours previous to the experiment. Normally, a rabbit's respirations during October are about 50 per minute, temperature, 99 F.

After being under the influence of the current for three hours, the temperature had fallen to 99.6 F. and the respirations were about 40 per minute.

While under the influence of this current the rabbit rested quietly and there was no muscular rigidity. The reflexes were less exaggerated than in the first experiment, but still exaggerated so that the slightest movement of air caused the animal to react. Sensibility to pain seemed to be less than normal; there was no reaction when a needle was thrust through its skin. But as the subject was a rabbit no definite conclusion should be drawn on the question of sensibility until further research have been made on dogs. Consciousness was not deeply suspended.

When the circuit was opened the animal instantly arose to its feet in a perfectly normal condition.

Other experiments were made using different frequencies and current intensities, but the conditions indicated above seemed to be most favorable. We then made a longer test of this current, subjecting to it a rabbit for a period of eight hours without interruption. The animal was in normal condition at the end of the experiment.

We tested the same current on one dog. The effects observed were similar to those obtained in the rabbit of the second experiment, but the temperature always rose to from 101 to 102

2. Frederick K. Vreeland.—A sine wave electric oscillator of the organ pipe type. *Physical Review,* Vol. XXVII, No. 4, October, 1908.

degrees F. after the animal had been in the circuit an hour or more.

We reserve our conclusions on the effects of this current until further researches into its value have been made. For the present we have suggested to the author of the apparatus to make certain modifications of the character of the current that will reduce the period of the passage of the current to 1/10 of the entire time.

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